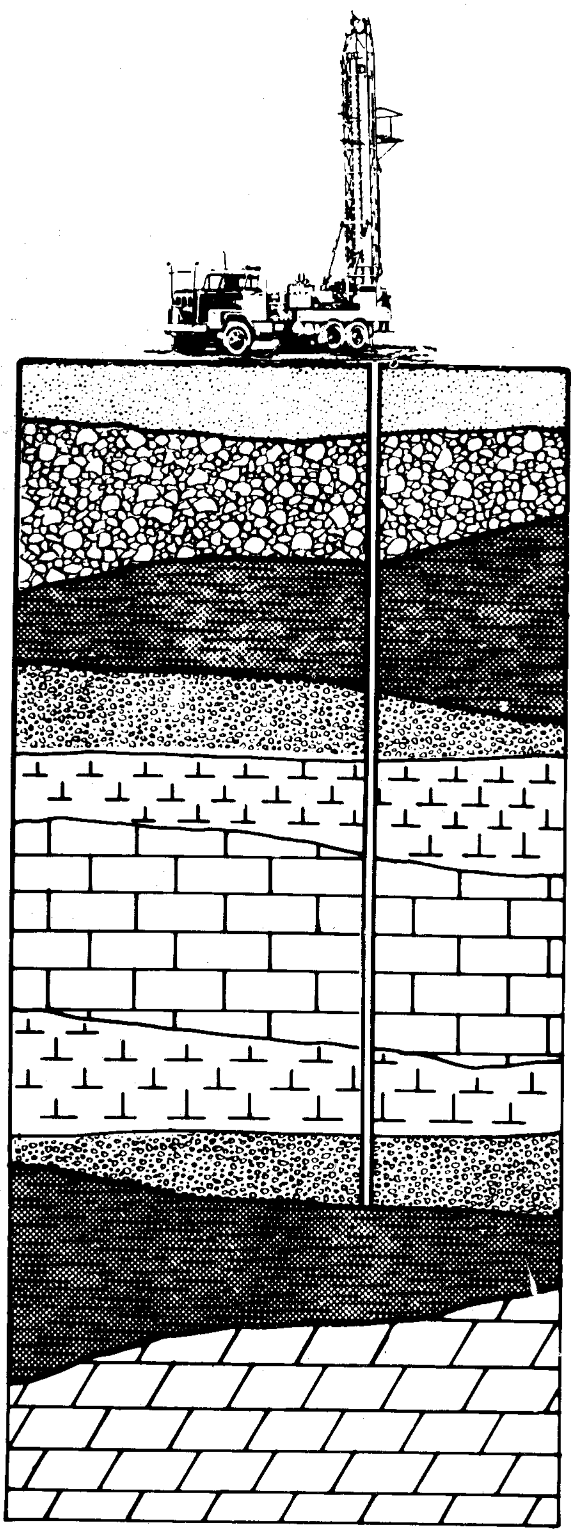


GROUND WATER RESOURCES OF ALBEMARLE COUNTY, VIRGINIA

By

R. McChesney Sterrett

and

Kenneth R. Hinkle

VALLEY REGIONAL OFFICE

COMMONWEALTH OF VIRGINIA

STATE WATER CONTROL BOARD

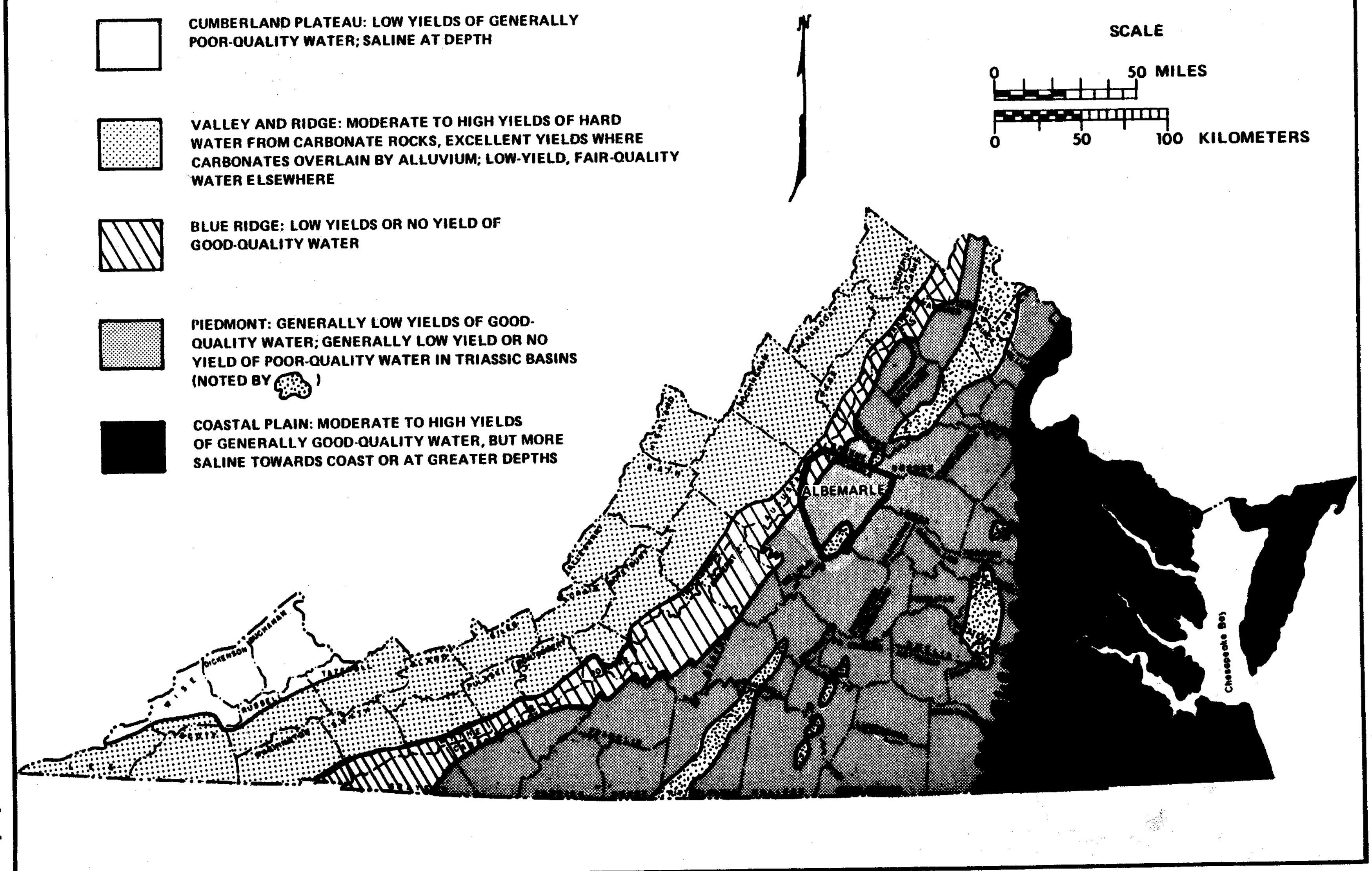
BUREAU OF WATER CONTROL MANAGEMENT

Richmond, Virginia

Planning Bulletin 326

December 1980

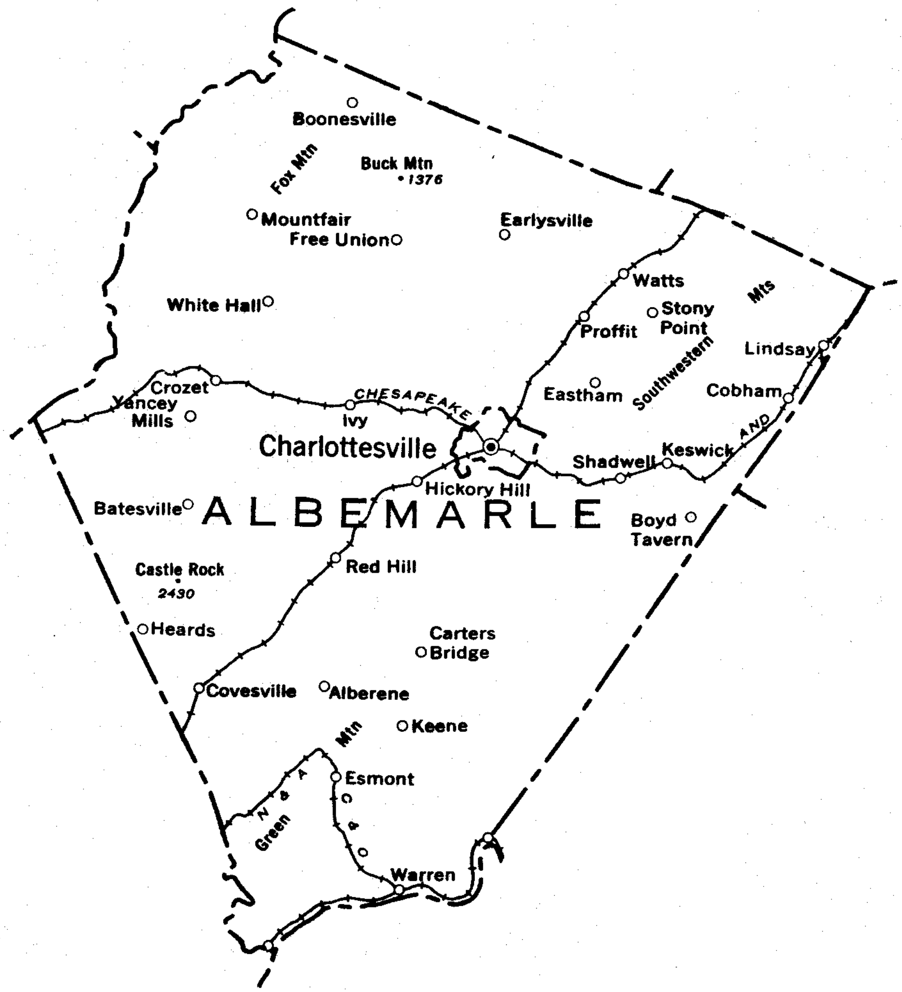
GROUND WATER CHARACTERISTICS OF THE PHYSIOGRAPHIC PROVINCES IN VIRGINIA



Source: Virginia State Water Control Board — BWCM

Frontispiece

GROUND WATER RESOURCES OF ALBEMARLE COUNTY, VIRGINIA



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FOREWORD

This report is one of a series intended to inventory the ground water resources of each county in the Commonwealth. The purpose is to provide all ground water users, including private citizens, developers, investors, well drilling contractors, government officials, professionals and consultants, with an overview of the ground water situation as it presently exists throughout Virginia.

Prospective ground water users and others interested in the development and protection of ground water hopefully will gain insight into the opportunities and advantages inherent in this invaluable natural resource.

The State Water Control Board remains available for information, assistance and governmental action.

ACKNOWLEDGEMENTS

Appreciation is extended to the citizens of Albemarle County for permitting water samples to be collected from their wells and springs and for supplying much of the well information contained in this report. Staff members of the Virginia Division of Mineral Resources were most helpful in supplying information and guidance pertaining to the geology of Albemarle County. Representatives of area industries and municipal water supplies served by ground water were most helpful in supplying information on their water systems. Quality and system data for public ground water supplies were obtained from the Virginia Department of Health. Well drilling contractors who have been especially cooperative in supplying information include Burner Well Drilling, Creger Well Drilling, Gentry Drilling Corporation, C. R. Moore Well Drilling, and Sydnor Hydrodynamics.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF PLATES

LIST OF PLATES (continued)

LIST OF TABLES

SELECTED CONVERSION FACTORS
ENGLISH UNITS TO INTERNATIONAL SYSTEM (METRIC UNITS)

This report uses a dual measurement system based on English units and the International System (SI) of metric units. SI is a consistent system of units adopted in 1960 by the Eleventh General Conference of Weights and Measures. Selected conversion factors are listed below:

Multiply English Units	By	To Obtain SI Units
Acres	0.4047	hectares
Feet (ft)	0.3048	metres (m)
Gallons	0.003785	cubic metres (m^3)
Gallons per day (gpd)	0.003785	cubic metres per day (m^3/d)
Gallons per minute (gpm)	0.06309	litres per second (l/s)
Inches	25.4	millimetres (mm)
Miles	1.609	kilometres (km)
Million gallons per day (MGD)	3,785.0	cubic metres per day (m^3/d)
Square miles	2.590	square kilometres (km^2)

GROUND WATER RESOURCES OF ALBEMARLE COUNTY, VIRGINIA

by

R. McChesney Sterrett and Kenneth R. Hinkle

ABSTRACT

Albemarle County is located in Central Virginia and encompasses an area of 739 square miles (1,914 square kilometres). The county includes portions of the Blue Ridge and Piedmont Physiographic Provinces and is contained within the Unglaciated Appalachian Ground Water Region.

Ground water availability and quality are relatively consistent across Albemarle County, although availability is significantly influenced by topographic setting. Draws and flats are the best drilling sites, and wells drilled at these locations generally produce more water at lesser depths. Water-bearing zones generally are encountered within 200 feet (61 metres) of the land surface in all areas of the county. Yields of up to 125 gpm (7.9 l/s) have been obtained in all areas, but yields of less than 10 gpm (0.6 l/s) are typical, especially in the southern half of the county. Total dissolved solids content throughout the county in most cases is less than 150 mg/l. Soft water is predominant in approximately half the county, while moderately hard to hard water is found elsewhere. Iron is generally at or below the 0.3 mg/l drinking water limit established by the Virginia Department of Health.

Wells developed in the metavolcanic rocks of the Catoctin Formation have the highest average yield (19 gpm or 1.2 l/s), with yields up to 150 gpm (9.5 l/s) reported along the base of Carter's Mountain and the Southwestern Mountains. Well yields of up to 50 gpm (3.15 l/s) have been obtained in the belt east of Charlottesville, but wells developed in the belt along the east slope of the Blue Ridge typically yield less than 10 gpm (0.6 l/s). Ground water from the Catoctin Formation is also the most highly mineralized water and generally exhibits higher manganese concentrations and hardness.

Average daily ground water withdrawal approaches 3 MGD (15,140 m^3/d). About two-thirds of the total withdrawal is supplied by domestic wells and springs, and approximately 47 percent of the county's population is supplied by ground water. Public ground water systems withdraw approximately 500,000 gpd (1,893 m^3/d). The largest ground water user, Morton Frozen Foods at Crozet, withdraws an average of nearly 120,000 gpd (454 m^3/d).

No major areas of ground water contamination have been identified, although local problems are known to exist. Underground petroleum spills are the most common cause of ground water contamination in Albemarle County. No documented cases of well interference have been reported.

INTRODUCTION

Location and Background Information

Albemarle County lies in the central part of the Commonwealth of Virginia (Plate 1). Bordering counties include Augusta and Rockingham to the west, Fluvanna and Louisa to the east, Orange and Greene to the north, and Nelson and Buckingham to the south. Albemarle County was formed from Goochland County in 1744 and is the fifth largest county in the state, covering 739 square miles (1,914 km^2). The independent City of Charlottesville is the county seat.

According to the Virginia Department of Planning and Budget, the 1980 population of Albemarle County was projected to be 54,400 and that of the City of Charlottesville to be 40,000. Population projections for the year 2000 are 88,400 for the county and 42,600 for the city.

Government employment and manufacturing are the two most important sources of income. Government employment is furnished principally by the University of Virginia, located in Charlottesville. Manufactured products include electrical components, electronic machinery, frozen food, office equipment and fabric.

Topography and Drainage

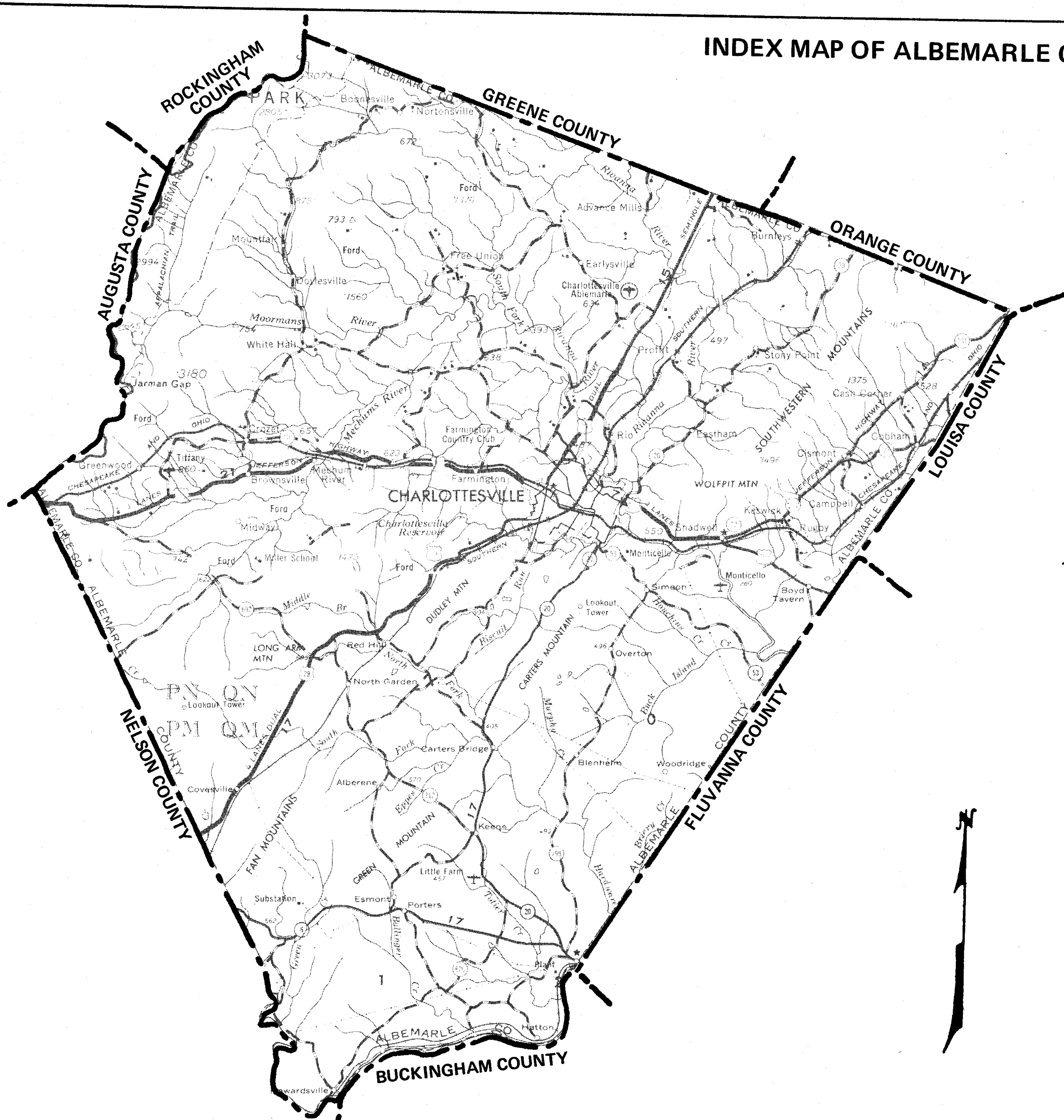
Albemarle County is situated within two physiographic provinces: The Blue Ridge Physiographic Province and the Piedmont Physiographic Province (Plate 2). The highest point in the county, 3,317 feet (1,011 m), is along the crest of Loft Mountain in the extreme northwestern corner of the county. The lowest elevation, approximately 235 feet (72 m), occurs where the Rivanna River crosses into Fluvanna County just south of Boyd Tavern. The elevation at Charlottesville is approximately 500 feet (152 m). Most areas of the county lie below 1,000 feet (305 m) elevation (Plate 3).

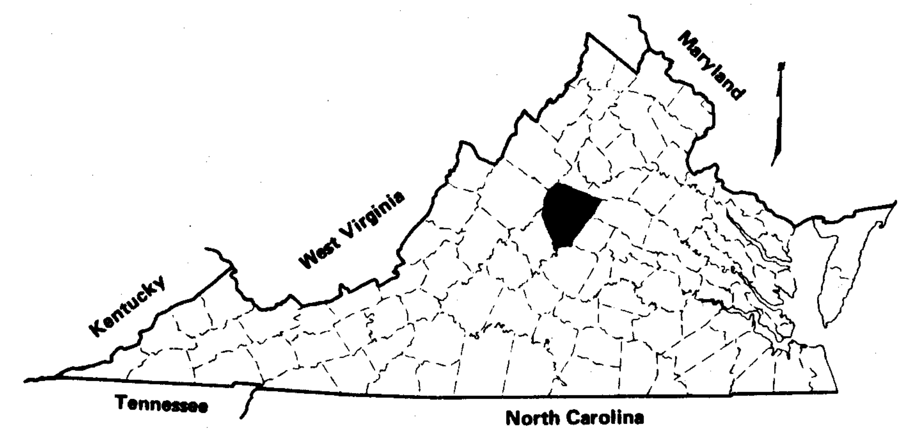
The county lies almost entirely within the James River Basin, with the exception of the northeast corner which lies within the York River Basin (Plate 4). The Rivanna River, a major tributary of the James River, drains a large portion of the northern and central sections of the county. The principal tributaries of the Rivanna include the North Fork, South Fork, Buck Mountain Creek, Mormons River and Mechum River. The southern section of the county is drained by the Hardware River and a few small tributaries of the James River. The James River forms the southern boundary of the county. A small northeastern portion of the county lying within the York River Basin is drained by small headwater tributaries of the South Anna River and the Rapidan River.

Climate

Warm, humid summers and mild winters characterize the climate of Albemarle County. According to Crockett (1972), the mountains at the county's

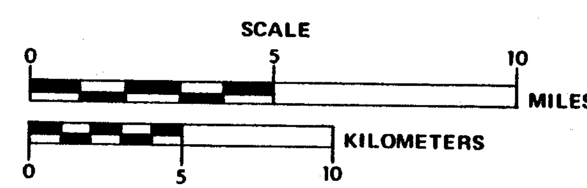
INDEX MAP OF ALBEMARLE COUNTY, VIRGINIA





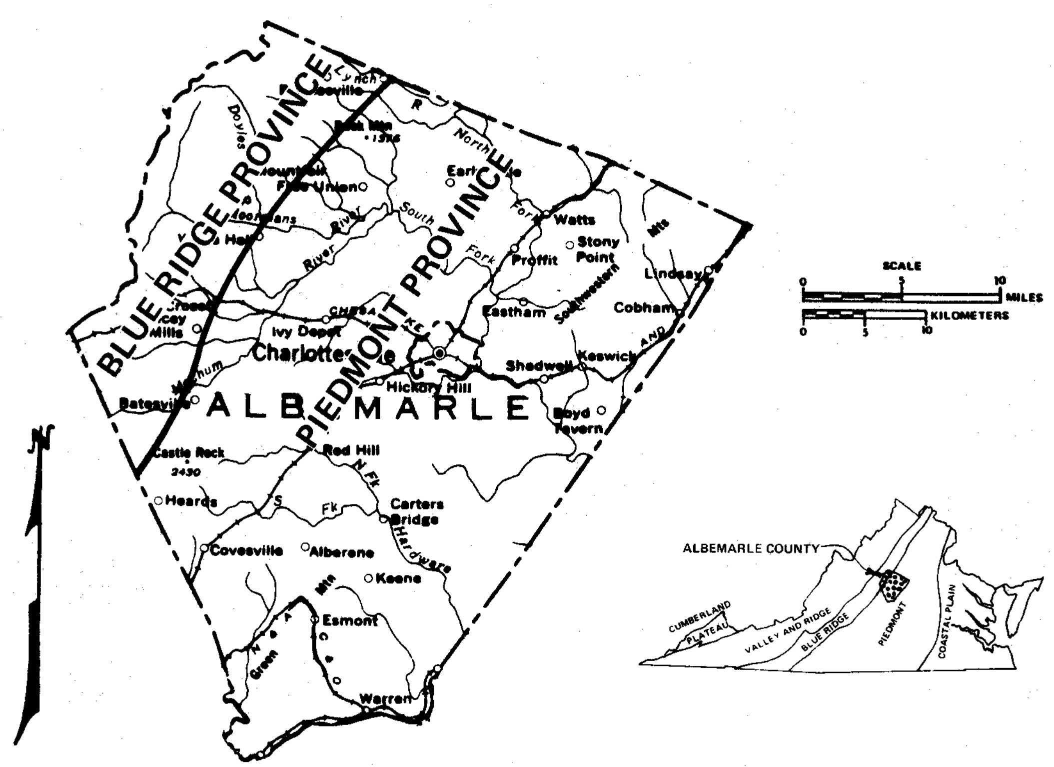
POPULATION PROJECTIONS (1980):
COUNTY 54,400
CHARLOTTESVILLE 40,000

AREA:
SQUARE MILES 739
SQUARE KILOMETERS 1,914



Source: U. S. Geological Survey (Base Map)

PHYSIOGRAPHIC PROVINCES OF ALBEMARLE COUNTY



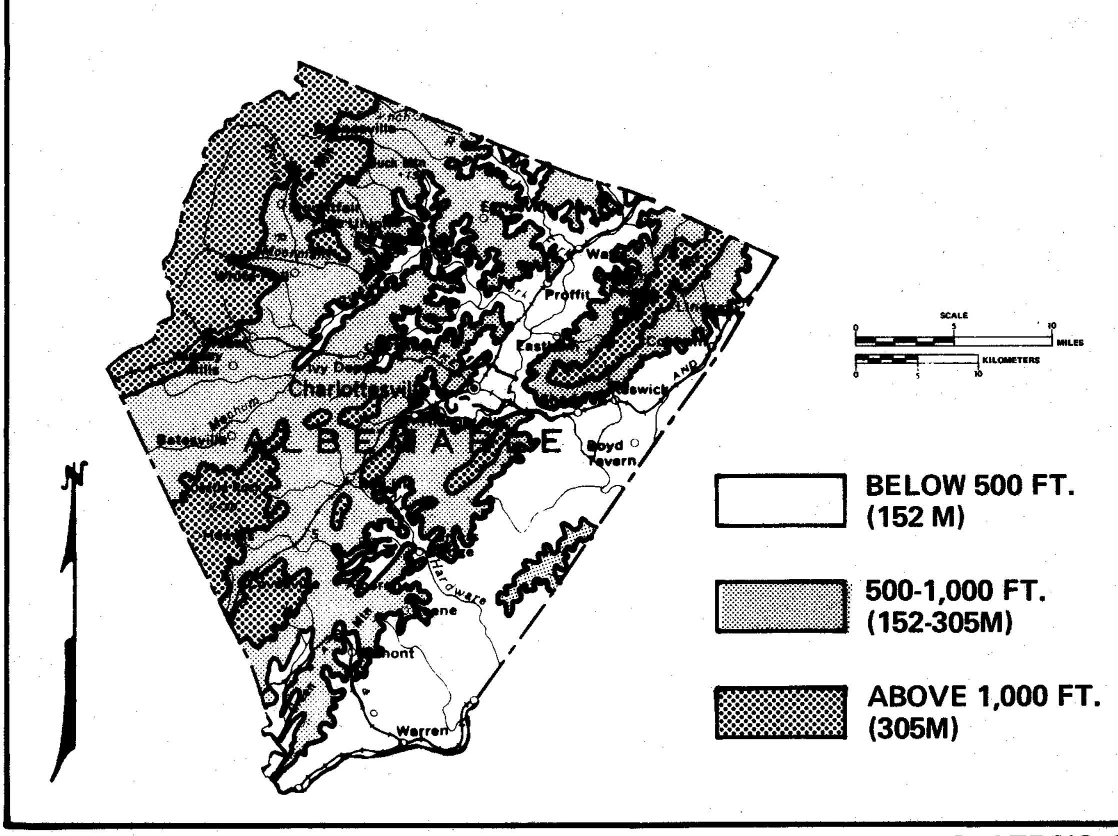
Source: Virginia Department of Conservation and Economic Development PLATE NO. 2

western boundary, along with the Chesapeake Bay and the Atlantic Ocean to the east, are major factors controlling the climate, in addition to the latitude and location on the North American continent.

Records from the non-recording weather station at Charlottesville maintained by the National Weather Service indicate that the average annual temperature is approximately 57°F (13.9°C). Extremes have been recorded as high as 107°F (41.7°C) in September, 1954, and as low as -2°F (-17.2°C) in January 1977. The average annual precipitation is approximately 44 inches (1,118 mm), and rainfall is the dominant form of precipitation. Summer rainfall is provided principally by showers and thunderstorms, the latter occurring on an average of 40 to 45 days throughout the season. The average annual snowfall is around 22.5 inches (572 mm), although measurements between 1941 and 1971 have varied from 3.1 inches (78 mm) to 53.6 inches (1,361 mm).

Table 1 is a summary of temperature and precipitation data for the period 1941-1979 from the National Weather Service non-recording weather station at Charlottesville, located 1.7 miles (2.7 km) west of the Post Office.

ELEVATION MAP OF ALBEMARLE COUNTY



Source: Virginia State Water Control Board — VRO PLATE NO. 3

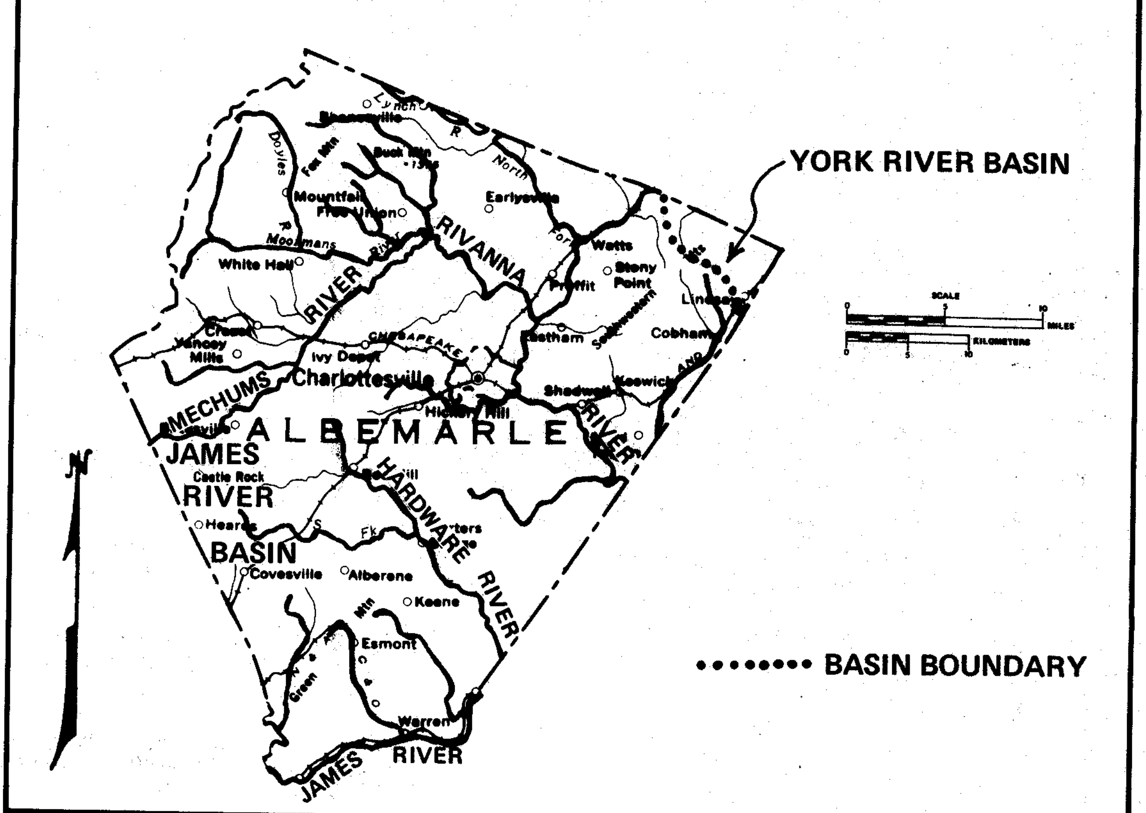
TABLE 1
WEATHER DATA FOR THE PERIOD 1941-1979
CHARLOTTESVILLE, VIRGINIA

Month	Average Temperature		Total Precipitation	
	^{o}F	^{o}C	Inches	Millimetres
January	36.1	2.3	3.21	81.53
February	37.8	3.2	2.94	74.68
March	46.5	8.1	3.97	100.84
April	57.7	14.3	3.19	81.03
May	66.3	19.1	4.19	106.43
June	73.5	23.1	3.69	99.06
July	77.3	25.2	4.78	121.41
August	76.2	24.6	4.73	120.14
September	69.9	21.1	4.43	112.52
October	59.5	15.3	4.02	102.11
November	49.1	9.5	3.12	79.25
December	38.4	3.6	3.54	89.92
Annual*	57.1	13.9	43.74	1110.99

*Average of annual averages and totals for period

Source: Crockett (1972) and National Oceanic and Atmospheric Administration (1971-1979)

RIVER BASINS AND STREAMS IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board — VRO

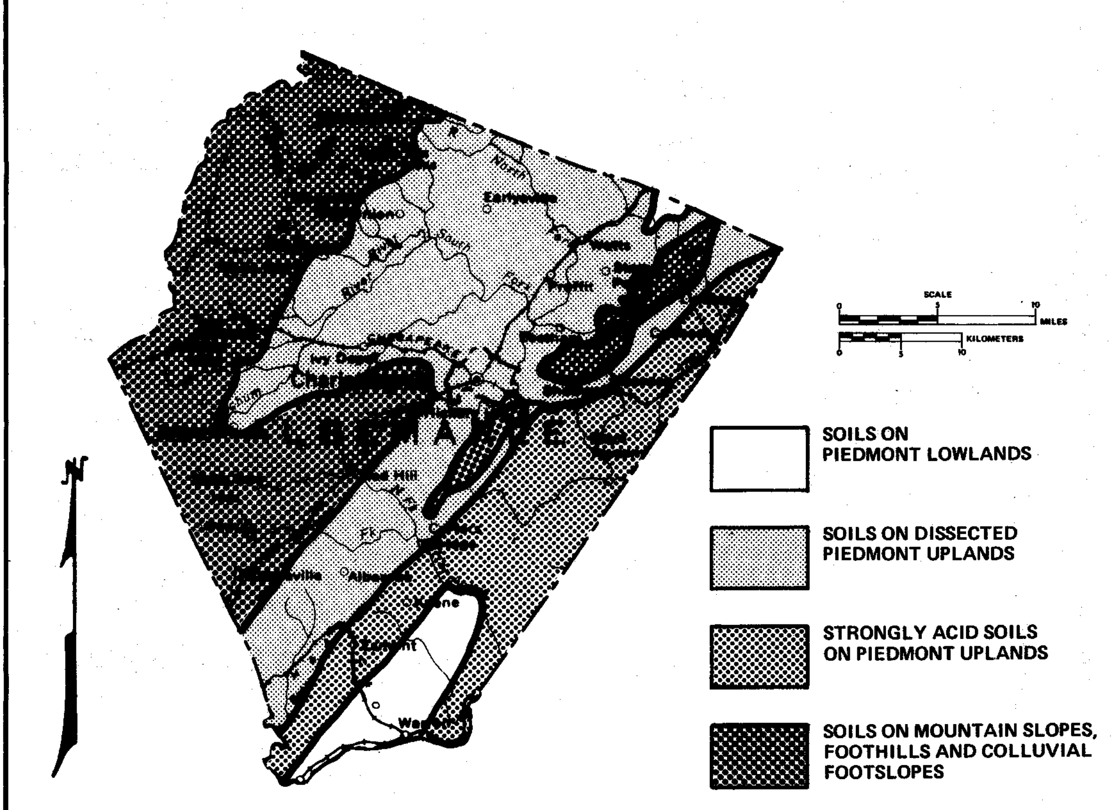
PLATE NO. 4

Soils and Vegetation

There are three major soil groupings in Albemarle County: mountainous soils, soils developed on the Piedmont uplands, and soils developed on the Piedmont lowlands (Plate 5). The mountainous soils include those soils on the Blue Ridge mountains and foothills, and soils on the Southwestern Mountains and Carters Mountain east of Charlottesville. These soils range from deep to shallow, depending on the steepness of the slope, and are well-drained. Soils of the Piedmont uplands range from deep to shallow and occur on gentle to steep slopes. All of the upland soils are well-drained, and a major belt along the Fluvanna County line to the east is characterized by very strongly acid soils. Piedmont lowland soils occupy the eastern quarter of the county and are well-drained.

A 1976 forest survey by the Virginia Division of Forestry reports that 291,386 acres (117,924 hectares) in Albemarle County are covered by commercial forestlands (Browne and Associates, 1979). This is nearly 62% of the total land area of the county. Such major forest areas provide an efficient mechanism for recharging the ground water system in Albemarle County.

GENERALIZED SOILS MAP OF ALBEMARLE COUNTY



Source: Modified after U. S. Department of Agriculture (1968) **PLATE NO. 5**

Purpose and Scope of Report

This report is a reconnaissance-level study intended as an aid in identifying regional ground water conditions in Albemarle County. In addition to providing general information about the area, the report introduces new hydrogeologic data collected by the Board and compiles previous geologic and hydrologic investigations carried out under the auspices of the Board and other state agencies. The report is intended to be a planning and management reference for citizens, governmental officials, professionals, and those in the business sector.

Previous Investigations

Reports by Cross (1960) and Dekay (1972) are the only ground water studies which deal specifically with portions of Albemarle County. Cross's work is a data compilation of water wells in the western half of the county. DeKay's work on ground water supplies in Shenandoah National Park, a portion of which is in Albemarle County, has been supplemented by a geology report of the area by Gathright (1976). A report by Geyer (1955) covers ground water in the Virginia Piedmont. A 1970 publication by the Virginia Division of

Water Resources covering the James River Basin includes ground water data obtained from Albemarle County. Two U.S. Geological Survey papers, Cederstrom (1972) and Sinnott and Cushing (1978), address the ground water characteristics in a large region which includes Albemarle County.

Methods of Investigation

Most of the water well construction information and the ground water quality data contained in this report have been collected by the Board, although some have been supplied by the Virginia Division of Mineral Resources and the Virginia Department of Health. All ground water withdrawal information has been collected by the Board.

Much of the previously unpublished information pertaining to individual well construction and ground water quality has been collected as a result of the Groundwater Act of 1973. This Act requires that a Water Well Completion Report (Form GW-2) be submitted to the Board for all wells drilled, and that owners of industrial and public ground water supplies submit quarterly reports (Form GW-6, Groundwater Pumpage and Use) to the Board detailing ground water withdrawal. In addition, the Board requires that drill cuttings be collected at ten-foot (3.05-m) intervals on all water wells, unless prior exemption is obtained from authorized staff members.

Another source of ground water quality information is the Pollution Response Program (PReP), maintained by the Board for the purpose of responding to reports of water pollution of any type. This includes pollution of both ground water and surface water by accidental or intentional discharges of hazardous chemicals, oil, gasoline, refuse, and industrial wastes.

All well information, well completion reports and records of ground water quality cited in this report are on permanent file at the Board Headquarters Office in Richmond and at the Valley Regional Office (VRO) in Bridgewater. These data are computerized for storage and retrieval and were used to compile Appendixes B and C.

Water Well Numbering System

Water Well Completion Reports are assigned a unique number by which the reported well is thereafter identified. Water quality and withdrawal information for that particular well also are identified by that number.

Each county in Virginia is assigned a three-digit county code, the code for Albemarle County being 101. Within each county, wells are numbered sequentially in order of receipt, with a few exceptions. For example, a report might be numbered 101-17, while a report received later would become 101-18. The well numbers do not represent a grid system for locating specific areas of the county. When citing specific wells in this report, the well number will be given in parentheses without the county code. For example, Morton Frozen Foods #3 (87). Well numbers may be cross-referenced with various plates and Appendixes B and C for additional information.

HYDROGEOLOGY OF ALBEMARLE COUNTY

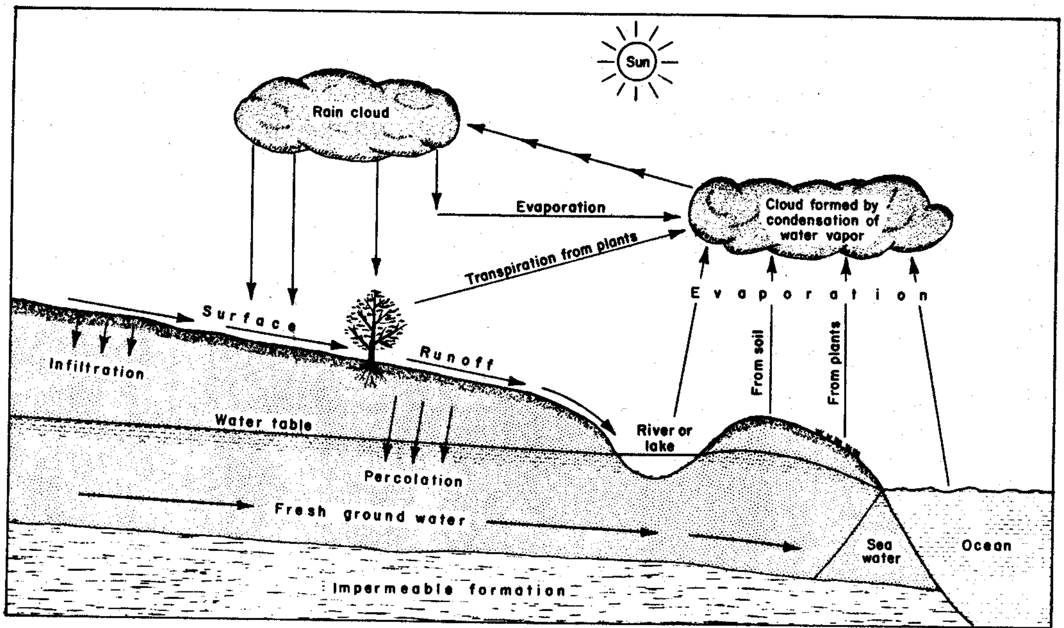
Precipitation probably is the ultimate source of all the ground water occurring in Albemarle County. The sequence in which water circulates from land to ocean to air and back to land in the solid, liquid and gaseous states is referred to as the hydrologic cycle (Plate 6). Water enters the atmosphere and forms clouds by evaporation from oceans, lakes and rivers, and from plant life by means of evapotranspiration. The water is then returned to the land surface where it once again may evaporate, take the form of runoff to streams, lakes and oceans, or filter down into the soil and rock.

Water occurring in the zone extending from the land surface downward to the point at which all rock and soil pores are filled with water is said to be in the zone of aeration. Water occurring below the zone of aeration is said to be in the zone of saturation, and it is this water that commonly is referred to as ground water. The top surface of the zone of saturation (the dividing point between the zone of saturation and the zone of aeration) is known as the water table (Plate 7).

Ground water is governed by the principles of recharge and discharge. Ground water will flow by gravity from an area of recharge toward a discharge point. Water may be discharged from the ground water reservoir through springs, seepage into streams, evaporation and transpiration, and through wells. Streams may discharge water into the ground water system, in which case they are known as losing streams, or they may be recharged by ground water flowing into them, in which case they are called gaining streams. It is the latter situation which explains why ground water discharge into streams and the base flow of streams during extended dry periods are one and the same.

Ground water movement and storage in Albemarle County occurs in both soil and rock. Saprolite, an earthy, clay-rich residual material created by the decomposition of igneous and metamorphic rocks, forms a mantle covering much of the county. According to Cross (1960), this layer of soil and saprolite is up to 100 feet (30 m) deep in places and averages about 50 feet (15 m). Data gathered on depth to bedrock for 319 wells supports Cross's findings. Many wells encountered bedrock at depths as great as 110 feet (34 m), but the majority fall in the 40-to 50-foot (12- to 15-m) range. Cross (1960) notes the saprolite is thickest in Albemarle County where it occurs on upland flats.

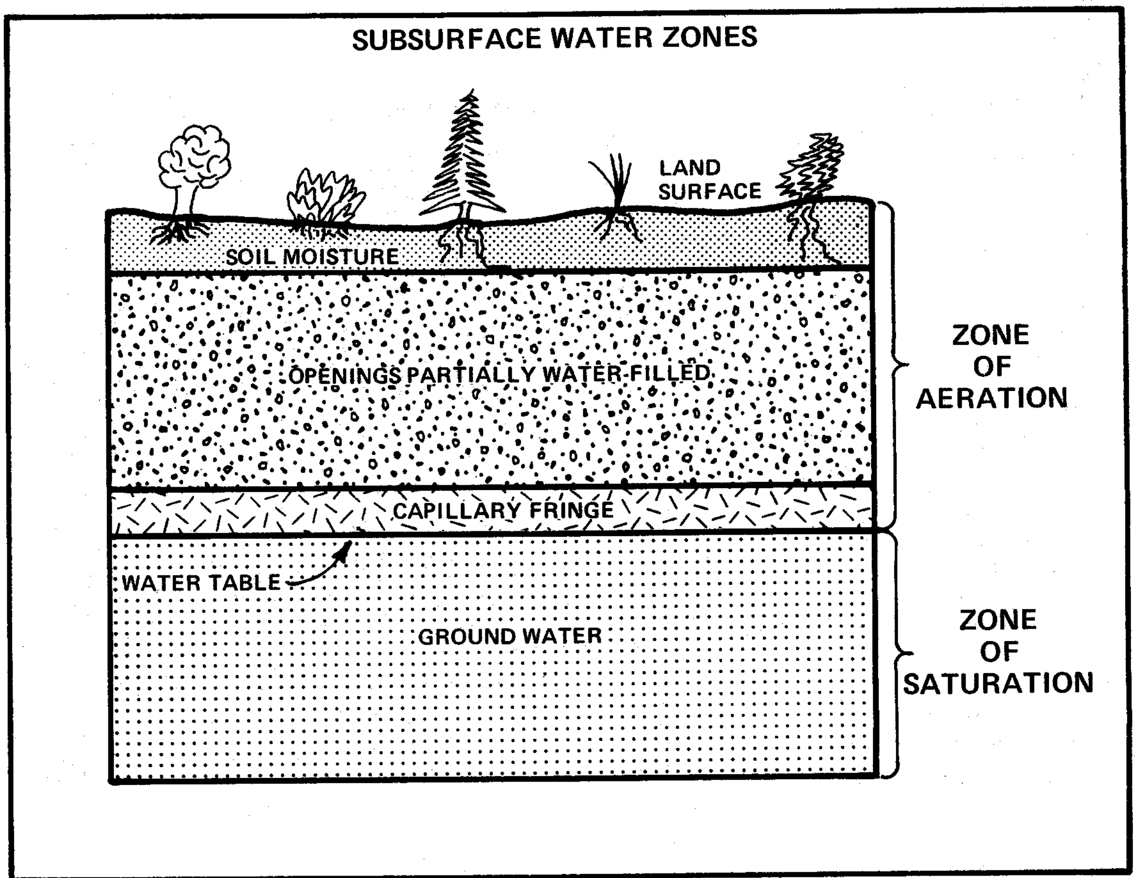
THE HYDROLOGIC CYCLE



Source: Gibson and Singer (1971) PLATE NO. 6

The saprolite zone acts as an important recharge mechanism for the underlying bedrock, and also yields water to many wells. The saprolite acts as a giant sponge and stores vast amounts of water, allowing it to percolate downward at a very slow rate to recharge the underlying crystalline rocks. It may yield water to wells by means of primary porosity, a term which refers to porosity which was created at the time the saprolite was formed.

Bedrock in Albemarle County is composed of igneous and metamorphic rocks, with minor amounts of sedimentary rocks present in the eastern areas. Igneous and metamorphic rocks are very dense and relatively impermeable. Ground water movement and storage takes place only in fractures which have developed in the rocks as a result of weathering and, to a lesser extent, structural deformation. This type of porosity is known as secondary porosity, since the water-bearing features developed after the rock was formed. Well yield is directly influenced by the frequency and interconnection of water-bearing fractures which the well intersects (Plate 8). The number and size of fractures decreases with depth, and generally it is assumed that water-bearing fractures seldom are encountered in these rocks at depths greater than 250-300 feet (76-91 m). For selected counties in the Virginia Piedmont, Auletta (1979) found that fracturing typically



Source: Virginia State Water Control Board — VRO

PLATE NO. 7

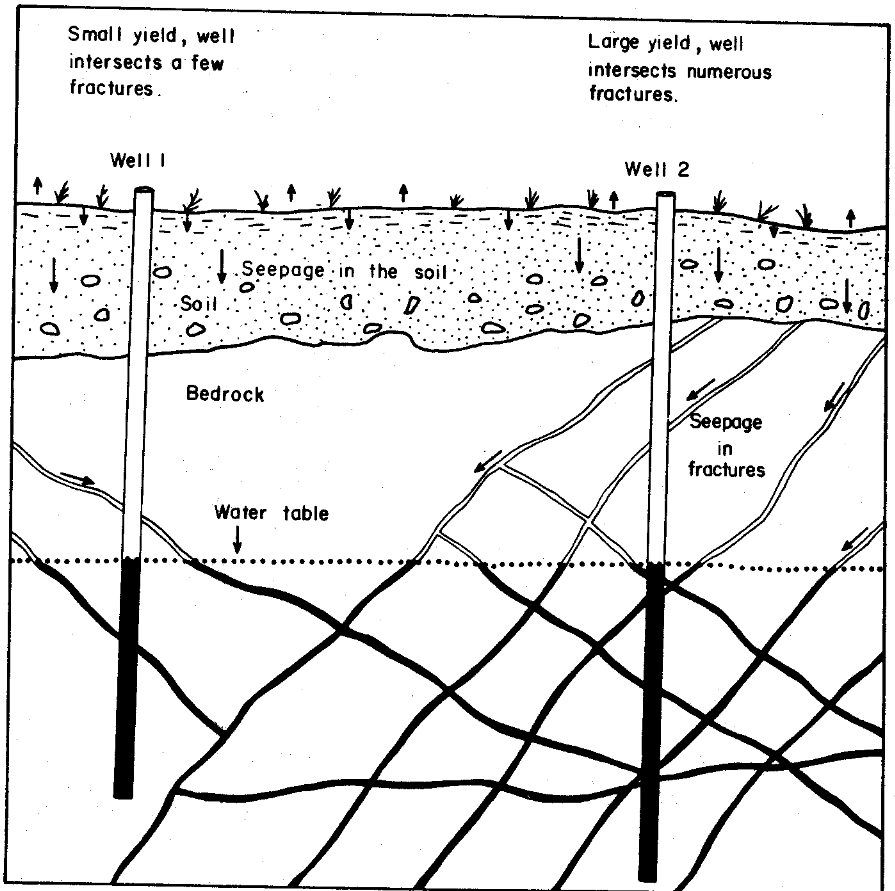
occurred between 30 and 350 feet (9 and 107 m) and was most frequent between approximately 80 and 125 feet (24 and 38 m). Cross (1960) notes that most fractures occur within 100 feet (30 m) of the top of bedrock. Data gathered for this report indicate that 58 percent of the 302 rock wells for which water zone information is available encountered water within 100 feet (30 m) of the land surface, and 87 percent encountered water within 200 feet (61 m) of the land surface.

GROUND WATER AVAILABILITY AND QUALITY

Hydrogeologic Overview of Albemarle County

Albemarle County is located within the Unglaciated Appalachian Ground Water Region (Plate 9) which is characterized by mountains and hilly uplands separated by broad valleys (Johnson, 1972). The western quarter of the county is situated in the Blue Ridge Physiographic Province, while the remaining area is in the Piedmont (see Plate 3).

FRACTURES IN BEDROCK FORMATIONS AFFECT WELL YIELD



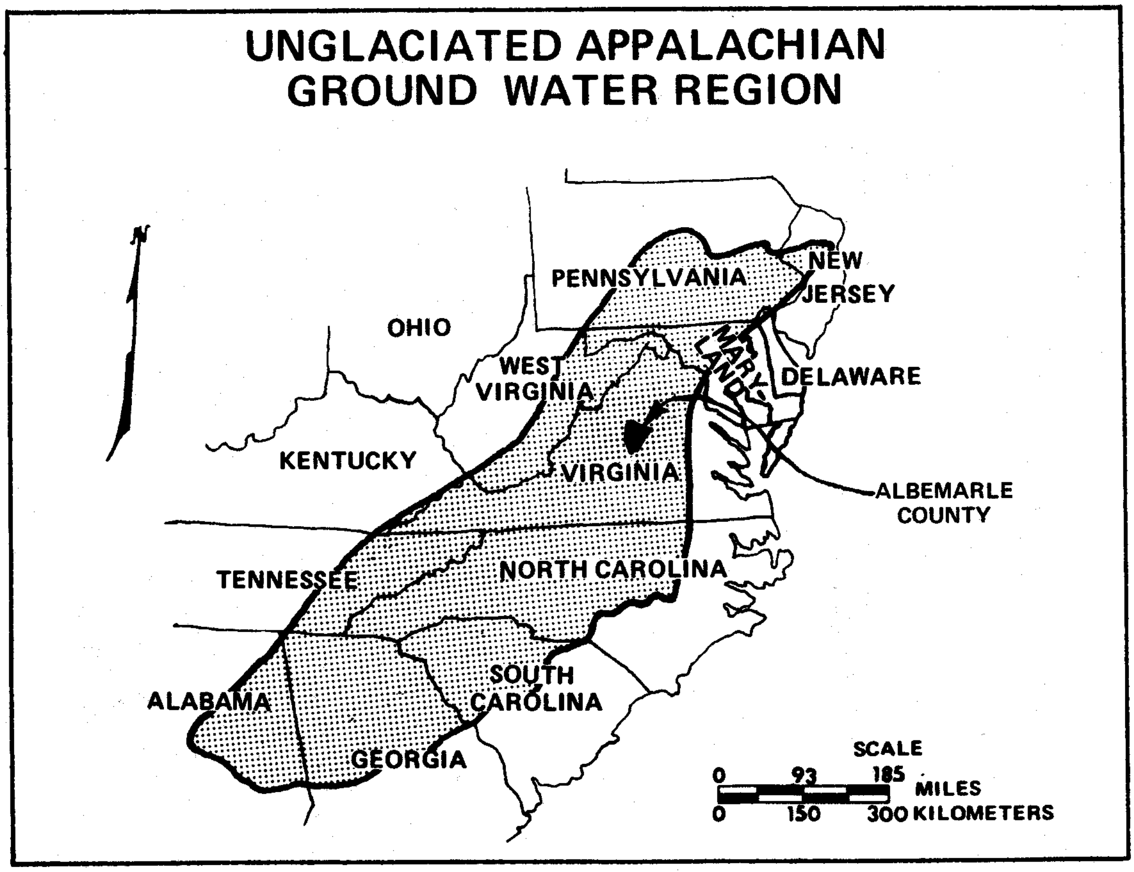
Source: Newport (1971)

PLATE NO. 8

The ground water availability and quality maps appearing on the next several pages are intended as a general planning guide, and conditions represented may not apply to specific well sites. Pumping tests and detailed aquifer studies are beyond the scope of this report and have not been undertaken. Discussions of ground water quality parameters may be found in Appendixes D and E.

On the whole, ground water availability is relatively consistent throughout the county, varying only slightly with geologic setting. Water-bearing zones generally are encountered within 200 feet (61 m) of the land surface throughout a large area (Plate 10). Almost without exception, wells in the eastern third of the county have not tapped water zones below 200 feet (61 m), indicating that drilling to deeper depths normally fails to increase well yields.

Well production rates typically are less than 10 gpm (0.6 l/s), especially in the southern half of the county (Plate 11). However, several areas exhibit a noticeably higher incidence of increased yield. Wells producing 50 gpm (3.2 l/s) or greater are scattered randomly across the county, and wells with yields of at least 125 gpm (7.9 l/s) have been drilled in each of the four hydrogeologic units in the county.



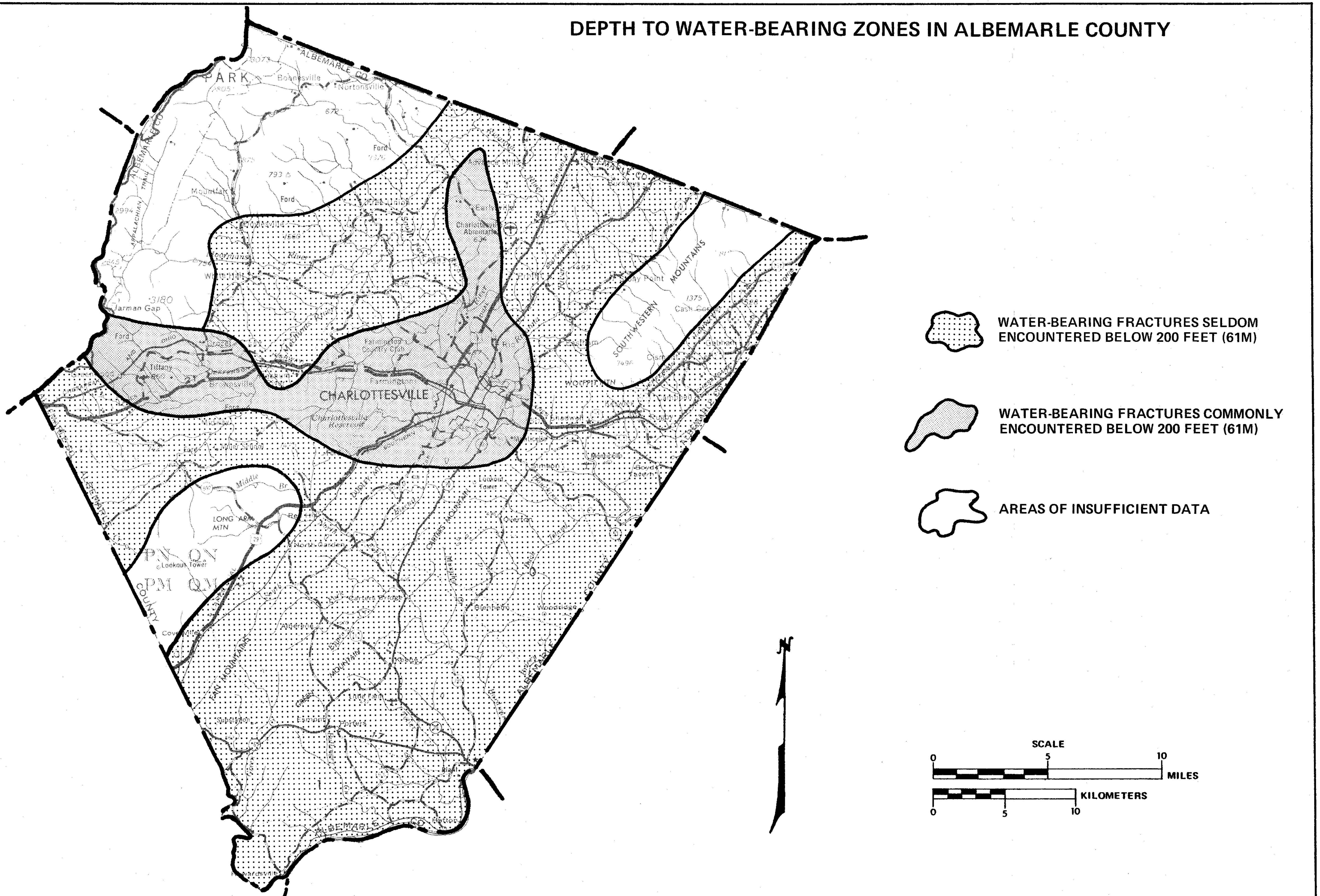
Source: Modified after Johnson (1972) PLATE NO. 9

Ground water throughout the county is of high quality, and only isolated wells have exhibited significant quality variations. The water is relatively low in dissolved mineral matter. The total dissolved solids content throughout the county is less than 150 mg/l (Plate 12). Isolated well samples with concentrations of 150 mg/l or higher are noted. No wells were encountered anywhere with total dissolved solids as high as 300 mg/l.

Hardness, the property of water which retards the production of soap lather, is relatively low throughout the county. The hardness classification used throughout this report was developed by Durfor and Becker as noted in Hem (1970):

Hardness range (mg/l of $CaCo_3$)	Description
0-60	Soft
61-120	Moderately hard
121-180	Hard
More than 180	Very hard

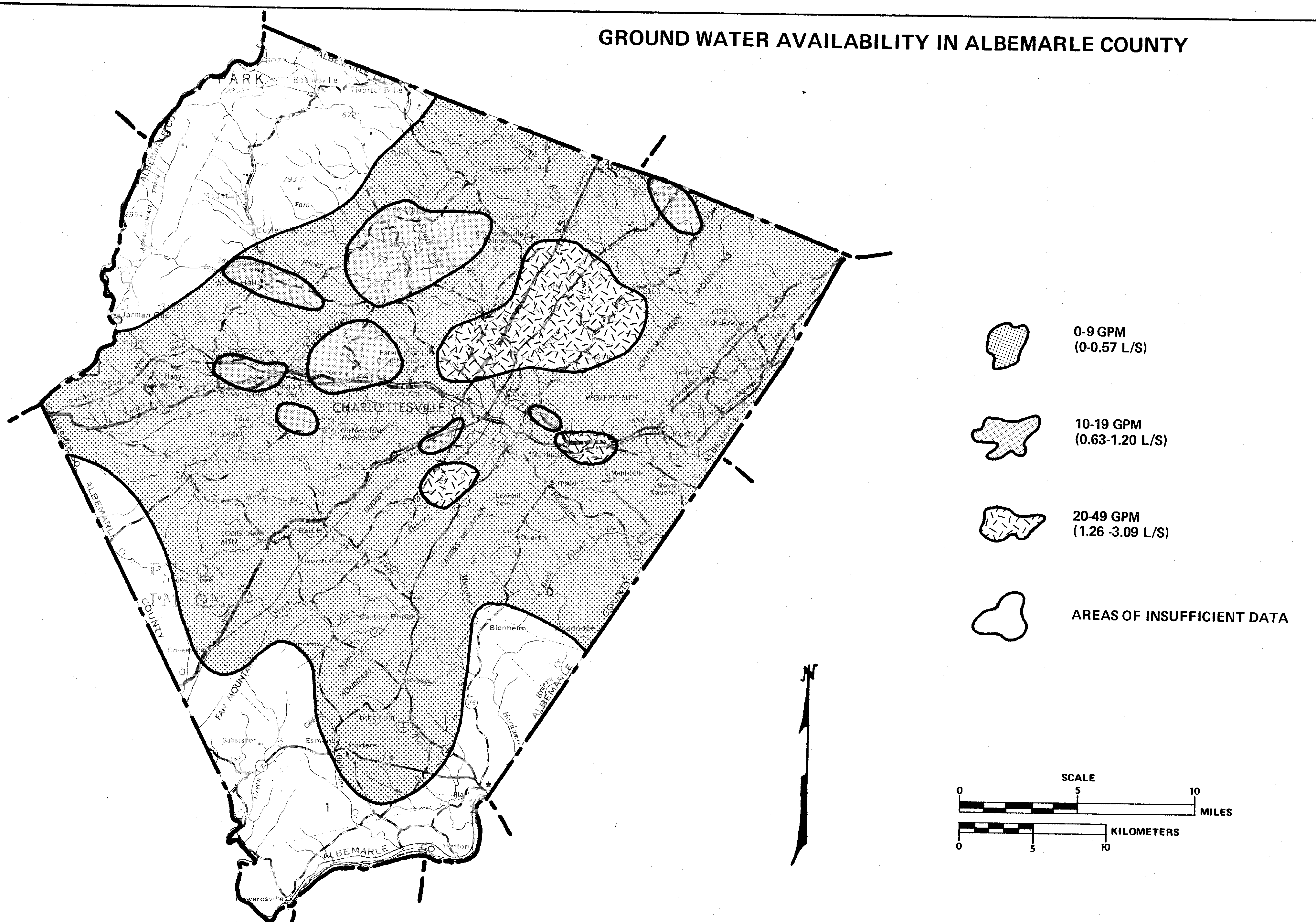
DEPTH TO WATER-BEARING ZONES IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 10

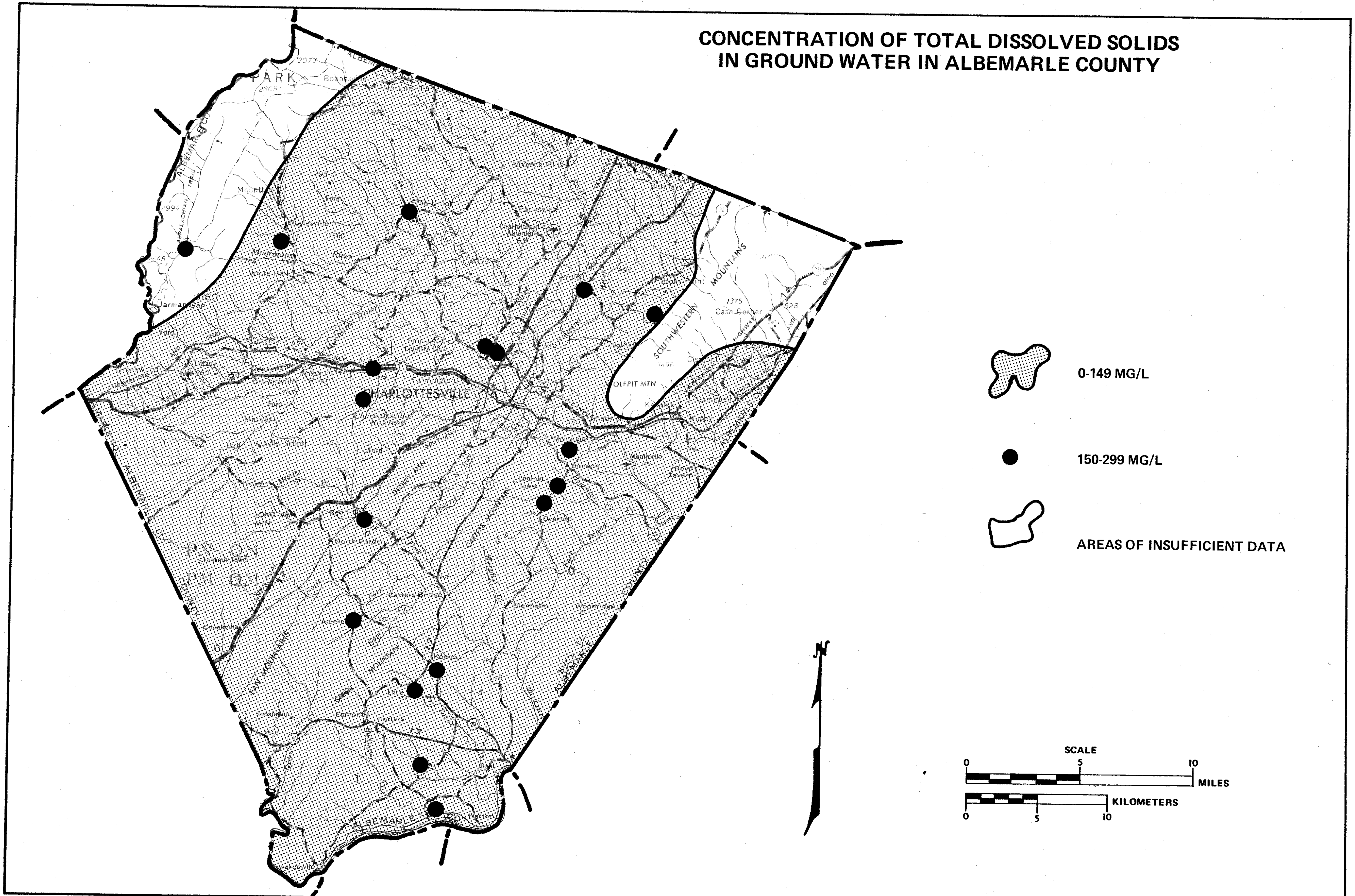
GROUND WATER AVAILABILITY IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 11

CONCENTRATION OF TOTAL DISSOLVED SOLIDS IN GROUND WATER IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 12

Based on this scale, soft water is predominant in approximately half the county, while moderately hard to hard water prevails elsewhere (Plate 13). A few samples of "very hard" water were gathered, but the highest value noted anywhere in the county was only 225 mg/l.

Iron concentrations are well within the 0.3 mg/l limit established by the Virginia Department of Health (1977) throughout a large portion of the county (Plate 14). However, there are several areas where noticeably higher concentrations are common to the extent that certain undesirable effects, such as unpleasant taste and staining of bathroom and laundry fixtures, are to be expected. Reports of such occurrences have been infrequent and scattered.

The hydrogen ion concentration, or pH, falls within a range of 6.5 - 7.4 throughout a significant portion of the county and below 6.5 throughout most of the remaining areas (Plate 15). With the exception of one sample (55) measured at 3.7, no values lower than 5.1 were recorded anywhere in the county. As the pH falls below the neutral point of 7 on a scale of 1-14, water tends to become more acidic and may cause corrosion of metal pipes, pumps and tanks.

Hydrogeologic Units in Albemarle County

The crystalline rocks which underlie Albemarle County have been divided into four broad hydrogeologic classifications, based on water-bearing characteristics of individual rock formations. These classifications include the cataclastic and metasedimentary rocks, the metasedimentary and sedimentary rocks, the metavolcanic rocks, and the igneous and metasedimentary rocks (Plate 16). Table 2 is a compilation of the individual geologic formations comprising these four hydrogeologic units and includes pertinent geological information, water-bearing properties, and selected well and ground water statistics. Detailed explanations of the geology of Albemarle County will not be given in this report. The reader is encouraged to consult published geologic reports of the county for information of this nature.

Hydrogeologic factors seldom are considered when selecting well sites in Albemarle County. Virtually all wells drilled are small-diameter wells, usually intended for domestic use, which rarely penetrate to great depths. Particularly with respect to residential wells, which constitute a large majority of the wells on record, the drill site is chosen after the building site has been selected and is based solely on the convenience and economics of the particular situation. In addition, once a sufficient supply of water has been obtained for the intended use, drilling is terminated. The available data are, therefore, random "practical" data instead of data based on the most favorable hydrologic, geologic and topographic conditions.

Igneous and Metasedimentary Rocks

This hydrogeologic unit (Plate 17) consists primarily of granitic gneiss with minor amounts of granodiorite, quartzite and conglomerate.

Geologic formations included in this grouping are the Pedlar, Swift Run, Lovingston and Rockfish Formations. Two major belts occur in Albemarle County. A belt lying along the foot of the Blue Ridge in the northern area of the county underlies the communities of White Hall, Doylesville, Mountfair, Boonesville and Nortonsville. A larger belt running northeast-southwest, roughly dividing the county in half, averages approximately 6 miles (10 km) wide and underlies the communities of Earlysville, Ivy and North Garden.

Wells in this hydrogeologic unit have been drilled to an average depth of just over 250 feet (76 m). Seventy-two percent of the wells drilled in these two belts produce less than 20 gpm (1.3 l/s); over half yield less than 10 gpm (0.6 l/s). However, 10 percent of the wells on record produce in excess of 50 gpm (3.2 l/s), indicating that large yields are available. While a few of these high-yield wells have been drilled for public supplies, the majority are domestic wells which probably required minimum development to obtain the high yields. These high-yield wells are randomly scattered and do not tend to occur in clusters. The southwest third of the central belt shows a significant lack of wells producing 10 gpm (0.6 l/s) or greater, possibly indicating lower potential for ground water in this particular area. Three wells drilled for the Crozet Sanitary District between 1955 and 1959 have yields ranging from 50 to 165 gpm (3.2 to 10.4 l/s). The 365-foot (111-m) well #1 (112) was tested for 72 hours at 165 gpm (10.4 l/s); however, no drawdown information is available.

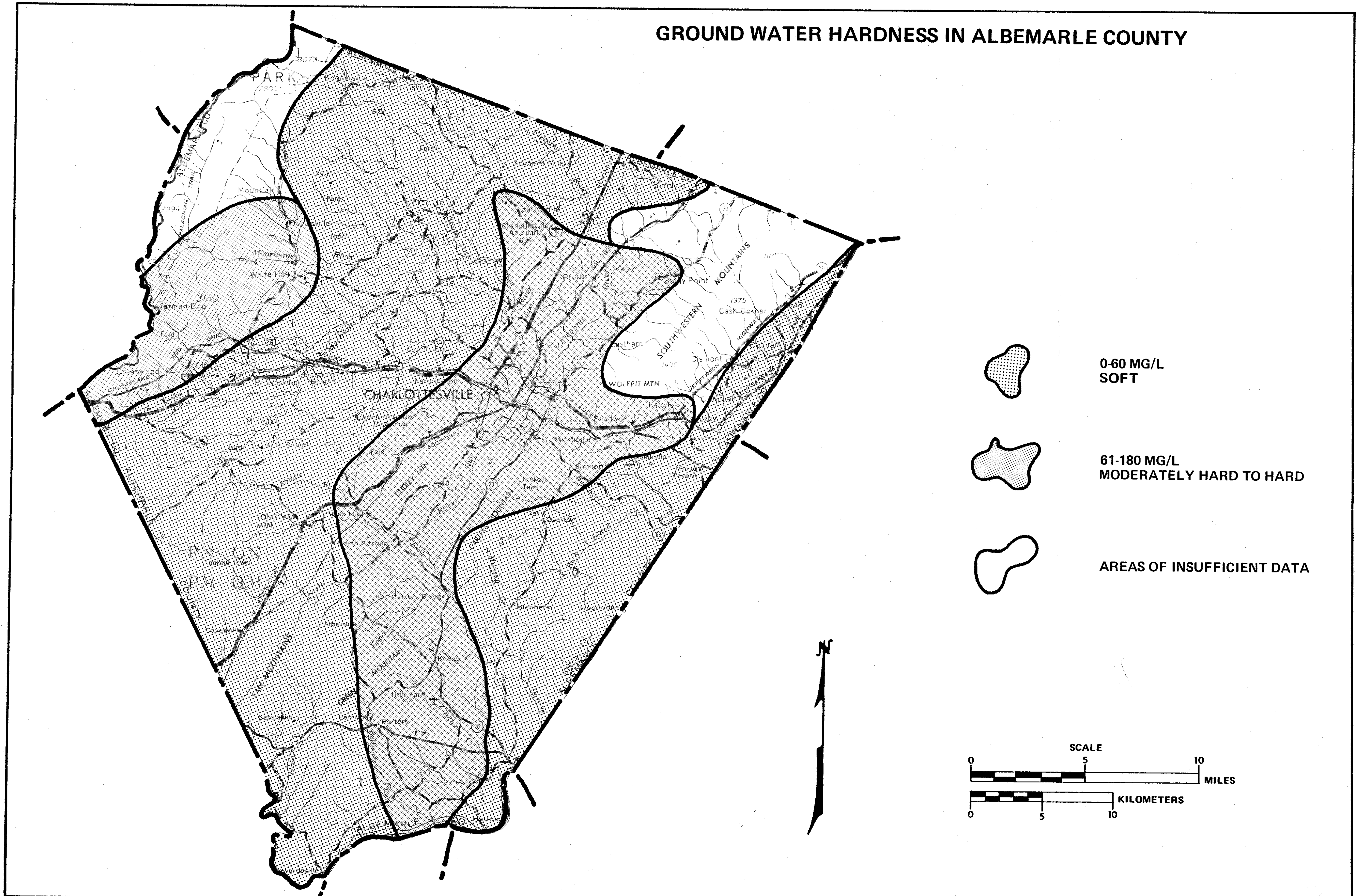
Water from the igneous and metamorphic rocks is relatively low in dissolved mineral matter; 84 percent of the wells on record exhibit total dissolved solids below 150 mg/l. pH values consistently fall within the 6.0 - 7.4 range. Water analyses from six wells in the Ivy area had pH values of 7.5 and above, somewhat higher than usually found throughout the remaining portion of the two belts.

Ground water hardness throughout the area is consistently lower than 121 mg/l, and only three of 78 water samples collected can be classified as "hard" (121-180 mg/l). Concentrations of iron were below 0.3 mg/l (the limit established by the Virginia Department of Health) in nearly two-thirds of 89 water samples. Of the remaining samples, only 7 percent were in excess of 5.0 mg/l. Iron concentrations in ground water samples collected along the base of the Blue Ridge seldom exceeded 0.3 mg/l.

Metavolcanic Rocks

This hydrogeologic unit (Plate 18) is comprised mainly of the Catoctin Formation, a series of metamorphosed basalt lava flows with minor amounts of sandstone and phyllite. Two belts extend the length of the county in a northeast-southwest direction. A small belt outcrops along the eastern ridges of the Blue Ridge, and a large belt passes through the eastern half of Charlottesville and underlies the communities of Eastham, Shadwell and Carters Bridge.

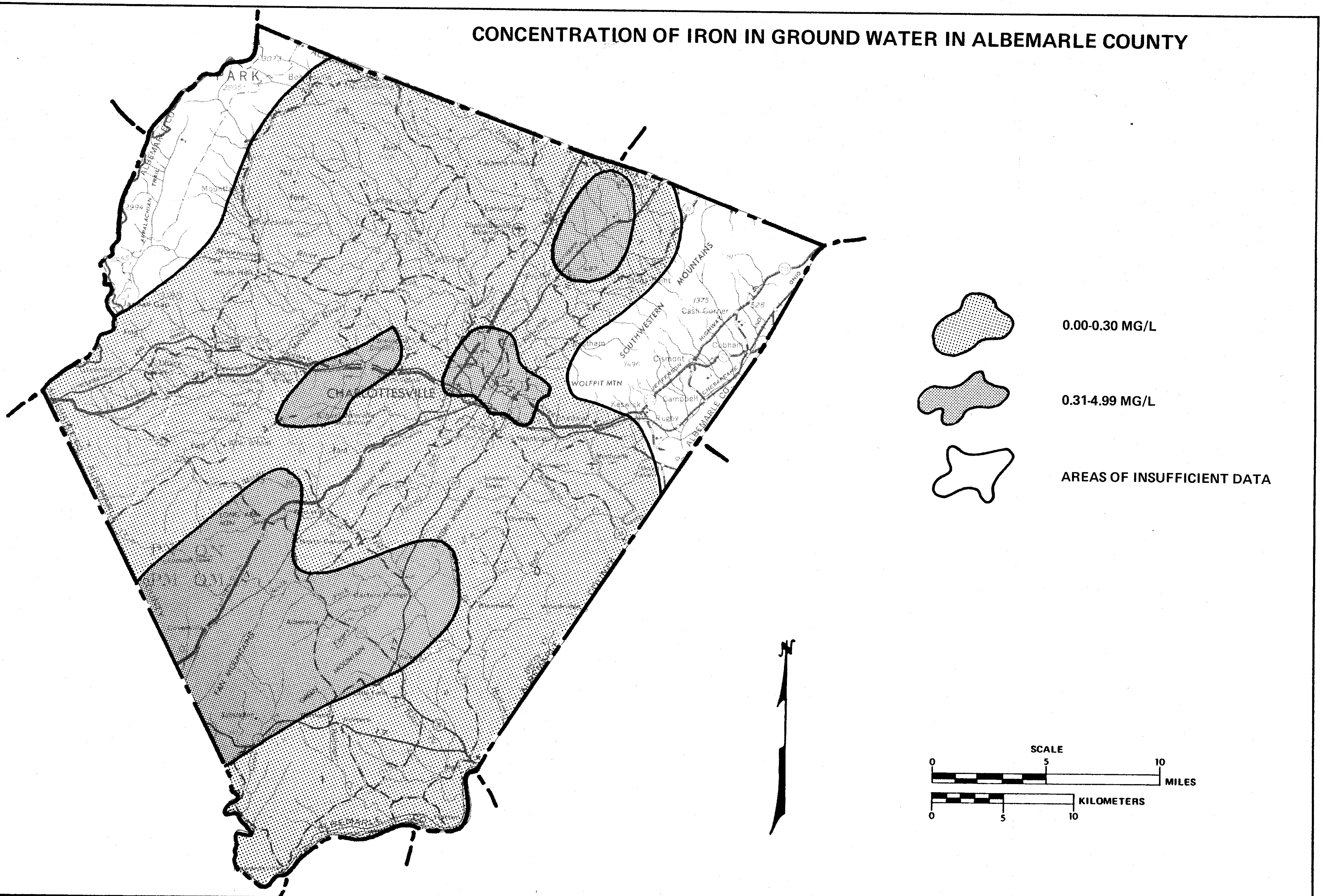
GROUND WATER HARDNESS IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 13

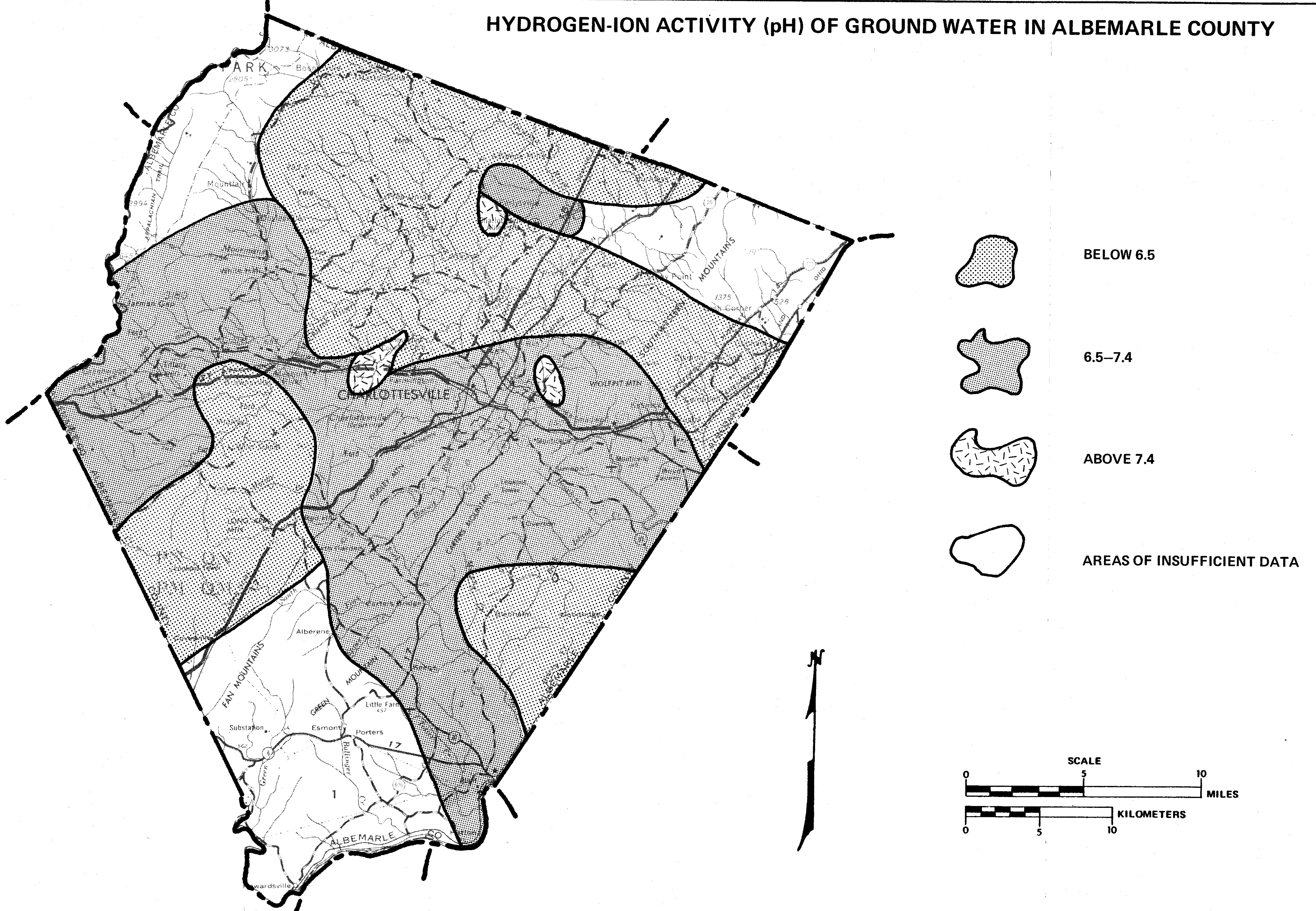
CONCENTRATION OF IRON IN GROUND WATER IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 14

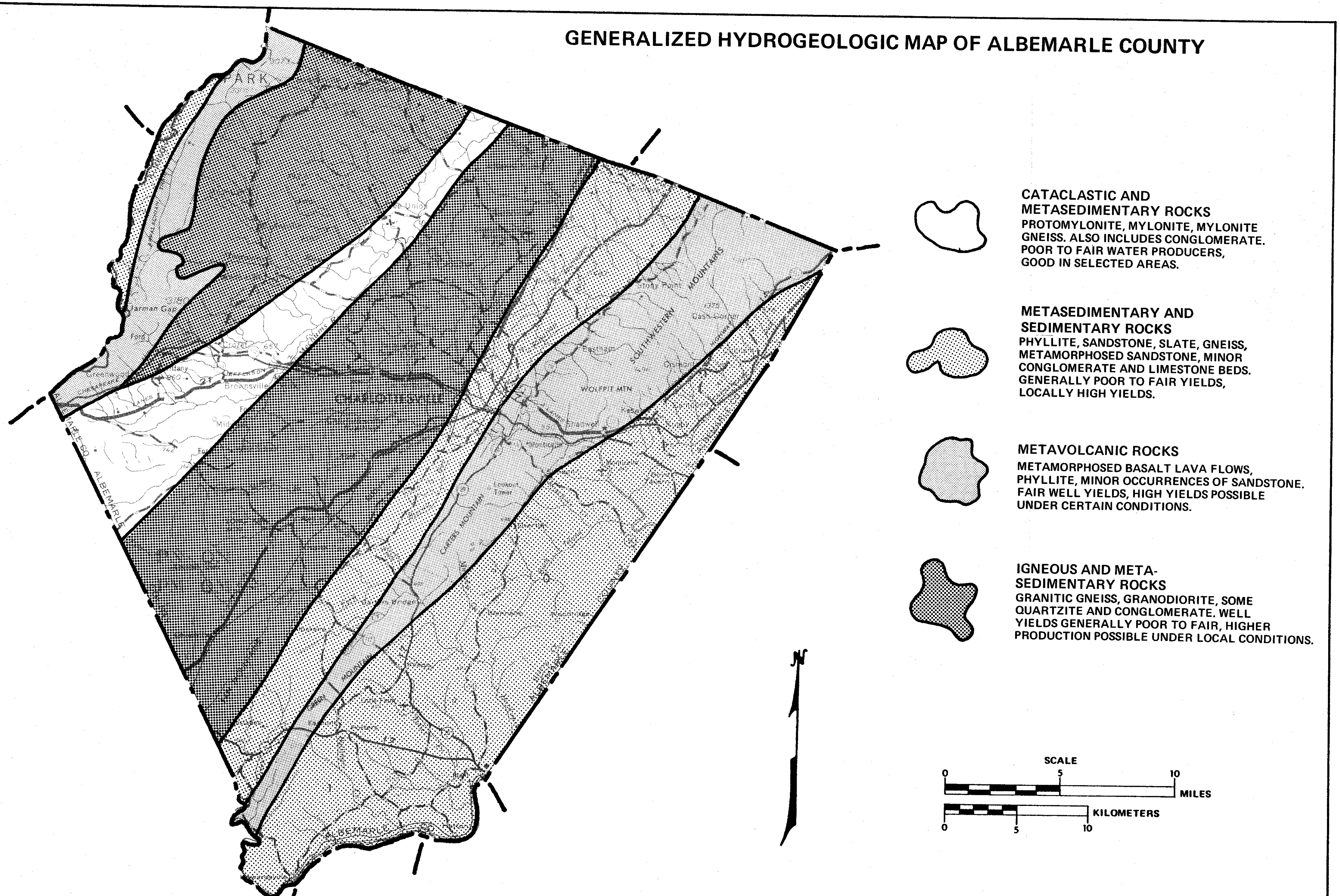
HYDROGEN-ION ACTIVITY (pH) OF GROUND WATER IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board – VRO

PLATE NO. 15

GENERALIZED HYDROGEOLOGIC MAP OF ALBEMARLE COUNTY



Source: Compiled from Various Publications of the Virginia Division of Mineral Resources

PLATE NO. 16

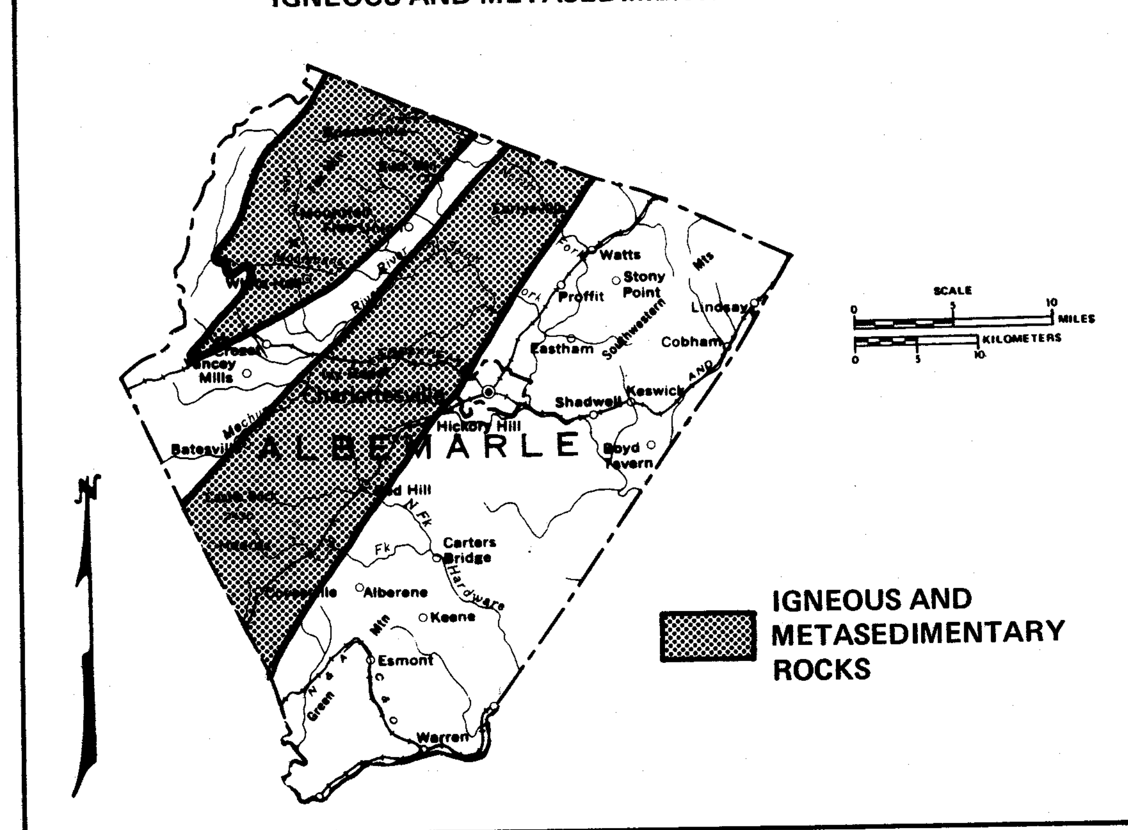
TABLE 2

HYDROGEOLOGIC UNITS AND THEIR GEOLOGIC AND WATER-BEARING CHARACTERISTICS

Hydrogeologic Unit and Individual Formations	Symbol	Age	Estimated Years Since Present	Lithology	Well and Ground Water Statistics+	Well Depth*	Well Yield**	Total Dissolved Solids	Ca, Mg Hardness	Iron	Manganese	Sulfate	pH	Water-Bearing Properties
Cataclastic and Metasedimentary Rocks —————— Mechum River cataclastics	CpCm cgs	Precambrian(?) altered from Precambrian rocks during Paleozoic Era	Possibly older than 600 million 280 million to 600 million	mylonite, protomylonite, mylonite gneiss, conglomerate	maximum	1,100 (335)	137 (8.6)	143	121	1.60	0.14	12.8	8.0	Low to moderate yields generally encountered. High yields have been obtained in Crozet area. Water generally of very high quality and is especially low in dissolved mineral matter.
					minimum	90 (27)	1 (0.06)	40	4	0.00	0.00	1.0	5.8	
					average	270 (82)	18 (1.1)	83	33	0.17	0.01	4.1	6.5	
					samples	61	55	27	27	29	29	31	33	
Metasedimentary and Sedimentary Rocks —————— Newark Everona Harpers Weverton Loudoun Charlottesville Johnson Mill Lynchburg	TRn Cev Ch Cw Cl pCch pCjm pClyg	Triassic Cambrian Precambrian	181 million to 230 million 500 million to 600 million older than 600 million	phyllite, sandstone, slate, gneiss, metamorphosed sandstone, minor conglomerate and limestone beds	maximum	845 (258)	125 (7.9)	288	167	11.00	1.50	54.0	8.3	Low to moderate yields. Several high-yield wells have been developed in Matthews Chapel area. Area north of South Fork Rivanna River appears to offer low potential; water there seldom encountered below 200 ft. (61 m). Water tends to be moderately hard. Local iron problems have been noted.
					minimum	30 (9)	1 (0.06)	13	2	0.00	0.00	0.0	5.1	
					average	246 (75)	17 (1.1)	103	53	0.68	0.81	5.6	6.7	
					samples	136	120	43	52	53	53	52	55	
Metavolcanic Rocks —————— Catoctin	CpCc	Precambrian(?)	Possibly older than 600 million	metamorphosed basalt lava flows (principally composed of greenstone), phyllite, some metasandstone	maximum	647 (197)	150 (9.5)	290	225	0.60	2.20	129.6	7.7	Offer highest potential in Albemarle County. Over one-third of all wells produce in excess of 20 gpm (1.3 l/s). All wells yielding 50 gpm (3.2 l/s) or better are located in the eastern belt. Belt along eastern slope of Blue Ridge consistently produces less than 10 gpm (0.6 l/s). Water more highly mineralized than that found in other areas of county; hard water fairly common.
					minimum	83 (25)	1 (0.06)	58	23	0.00	0.00	2.0	6.2	
					average	297 (91)	19 (1.2)	161	112	0.19	0.35	5.6	7.0	
					samples	68	63	19	21	22	20	23	24	
Igneous and Metasedimentary Rocks —————— Swift Run Rockfish Pedlar Lovingston	CpCs pCr pCp pClgr	Precambrian(?) Precambrian	Possibly older than 600 million older than 600 million	granitic gneiss, granodiorite, some quartzite and conglomerate	maximum	834 (254)	165 (10.4)	260	177	13.00	1.00	25.0	8.2	Low to moderate yields generally available. Southwest portion of central belt offers poor development potential. Several high-yield wells have been developed in remote locations. Water generally of reasonable quality. Iron concentrations consistently below 0.3 mg/l along base of Blue Ridge.
					minimum	60 (18)	1 (0.06)	28	4	0.00	0.00	0.1	3.7	
					average	253 (77)	15 (0.9)	101	49	0.97	0.10	4.7	6.8	
					samples	217	240	84	89	91	87	84	93	

+All quality values in milligrams per litre except pH (no units)
*Top units feet, bottom units metres
**Top units gallons per minute, bottom units litres per second
Source: Geology compiled from various publications of the Virginia Division of Mineral Resources, geohydrology from Virginia State Water Control Board - VRO

IGNEOUS AND METASEDIMENTARY ROCKS

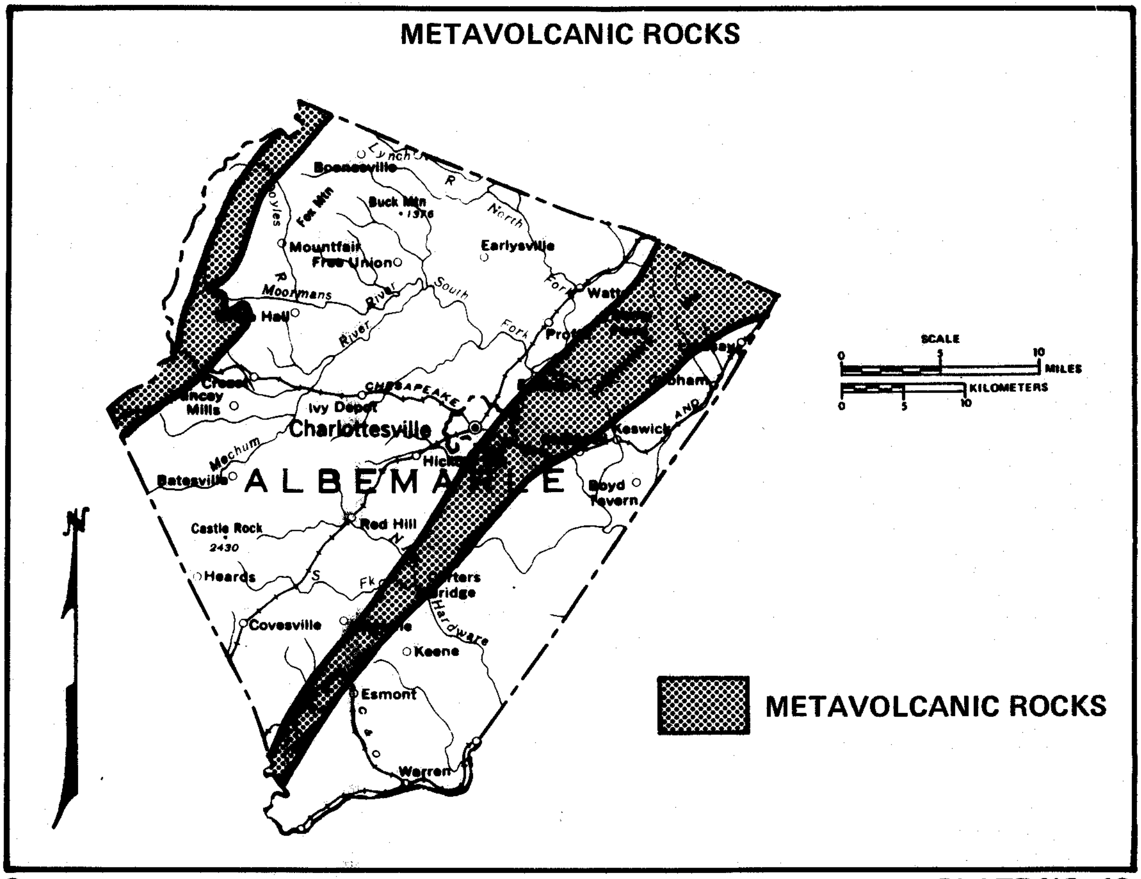


Source: Virginia State Water Control Board – VRO

PLATE NO. 17

The Catoctin Formation tends to be massive and competent. Fractures are said to occur less frequently in this unit than in other rock types across the county, though generally they are larger due to the greater solubility of the formation (Cross, 1960). The number of water-bearing fractures significantly decreases with depth; however, Catoctin wells encounter water-bearing fractures below 300 feet (91 m) more frequently than wells drilled in any of the other rock formations across the county. Most wells tapping deep water zones are located in the eastern Catoctin belt and occur along the base of Carters Mountain and the Southwestern Mountains. Several of these wells have produced up to 150 gpm (9.5 l/s). This is attributable to increased runoff from the mountain slopes which promotes more extensive weathering of the bedrock. Increased weathering tends to increase both the depth and openness of fractures and in turn creates a thicker cover of residual material which is capable of storing greater amounts of ground water. Fractures in these areas are more likely to be water-bearing than in areas where abundant runoff is not available.

Wells developed in the metavolcanic rocks have the highest average yield of any wells in the county. The average yield of 64 wells drilled in the two belts is 19 gpm (1.2 l/s). Thirty-five percent of these wells have reported yields of greater than 20 gpm (1.2 l/s), and several



Source: Virginia State Water Control Board — VRO PLATE NO. 18

wells reportedly produce up to 150 gpm (9.5 l/s). All wells with yields of 50 gpm (3.2 l/s) or greater are located in the eastern belt, whereas wells in the belt along the eastern slopes of the Blue Ridge consistently produce less than 10 gpm (0.6 l/s). Although information from the Blue Ridge belt is scant, the data probably are representative since the mountainous topography contributes to increased runoff and reduced storage.

The most intensely-developed area appears to be in the vicinity of Route 250 east of Charlottesville. Most of these wells have produced less than 20 gpm (1.2 l/s), but one in five has yielded up to 50 gpm (3.2 l/s). The majority of these wells have encountered producing zones within 200 feet (61 m) of the land surface. Although several wells have been drilled to depths greater than 500 feet (152 m), few have intersected water-bearing fractures at that depth. The median well depth along this corridor is 305 feet (93 m), while the average depth is 316 feet (96 m).

The ground water in the metavolcanic rocks is the most highly-mineralized ground water found throughout Albemarle County. However, total dissolved solids fall within the 50-300 mg/l range on every water sample collected from these wells. The pH for all wells is within the range of 6.0 - 7.0, without exception. The majority of the samples were measured at greater than 7.0, typical of the basic (alkaline) rock types which characterize the metavolcanics.

Hardness, on the average, is higher in the metavolcanics than in any other rock type throughout the county. Nearly one-third of the water samples collected in this unit showed hardness in excess of 180 mg/1, or "very hard". Another 27 percent can be classified in the "hard" range (121-180 mg/1). The majority of the "hard" and "very hard" samples were collected in the heavily-developed area just east of Charlottesville. Calcium appears to be the major contributing factor to hardness in the metavolcanics.

Iron concentrations in ground water from metavolcanic wells are similar to those in other rock units across the county. Iron in approximately two-thirds of the water samples collected from this area was within the 0.3 mg/1 drinking water limit established by the Virginia Department of Health. Nearly all of the remaining water samples showed values of less than 1.0 mg/1. Manganese, like hardness, tends to be higher in the metavolcanics than in the other hydrogeologic units in Albemarle County. Thirty percent of the metavolcanic wells yielded water with manganese concentrations in excess of 0.5 mg/1, while no more than four percent of the samples from any other sections of the county were in excess of 0.5 mg/1.

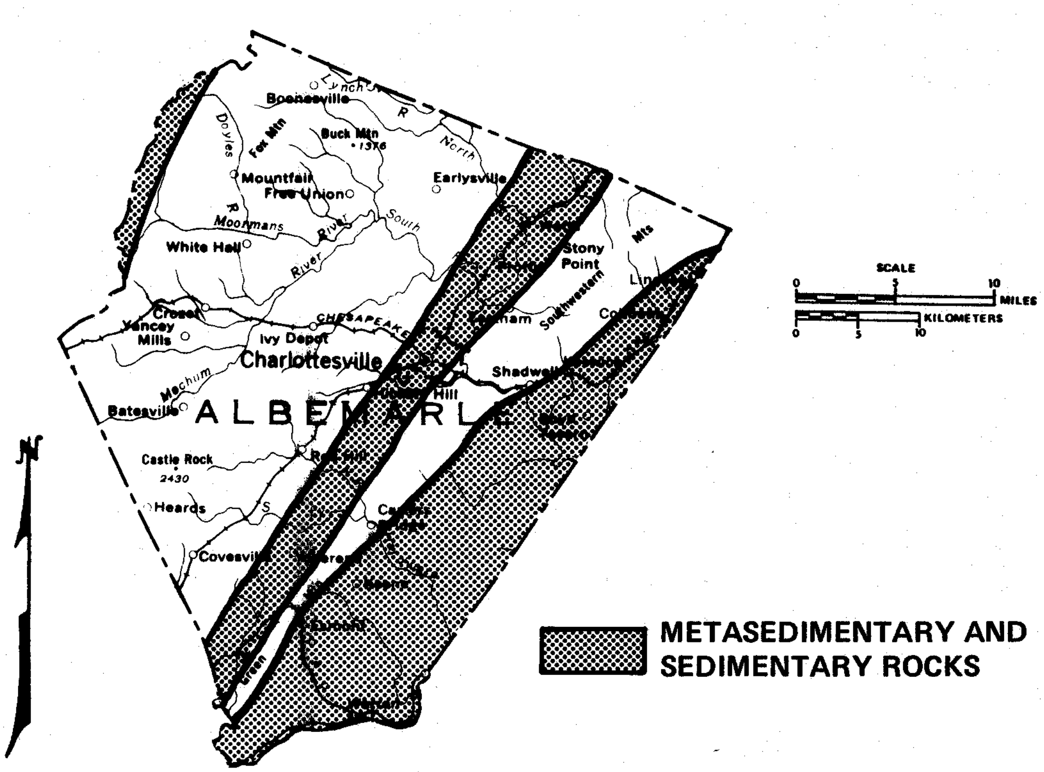
Metasedimentary and Sedimentary Rocks

Rock types in this hydrogeologic unit (Plate 19) include sandstone, phyllite and gneiss occurring in two major belts in eastern Albemarle County and a minor belt along the crest of the Blue Ridge. Rock formations included are the Weverton, Loudoun, Harpers, Lynchburg, Charlottesville, Johnson Mill, the Triassic basins and the Everona limestone. No records are available for wells penetrating formations along the crest of the Blue Ridge; therefore, all data cited refer to the two eastern belts.

A belt extending southwest from Burnleys at the Orange County border includes the central Charlottesville area and the communities of Proffit, Rio, Alberene and Unionville. Wells in this belt have been fairly productive. Five wells north of Chestnut Grove in the Matthews Chapel area south of Charlottesville reportedly produce in excess of 50 gpm (3.2 1/s), and six other wells in the immediate area yield greater than 20 gpm (1.3 1/s). Records of three wells drilled within the city limits of Charlottesville in the early 1900's show yields ranging from 80 to 100 gpm (5.0 to 6.3 1/s). Wells north of the South Fork Rivanna River have noticeably lower yields. Only three of 20 wells north of the river have yields in excess of 20 gpm (1.3 1/s), and the majority of the remainder have yields less than 10 gpm (0.6 1/s).

The belt bordering Fluvanna and Louisa counties and underlying the communities of Cobham, Boyd Tavern, Blenheim and Howardsville offers significantly lower ground water potential than the central belt. Fifty-four percent of all wells in this belt yield less than

METASEDIMENTARY AND SEDIMENTARY ROCKS



Source: Virginia State Water Control Board — VRO PLATE NO. 19

5 gpm (0.3 l/s), and 70 percent produce less than 10 gpm (0.6 l/s). Only a small percentage of wells drilled deeper than 200 feet (61 m) encountered water-bearing fractures. Wells drilled in this area generally are suitable only for domestic uses. As a rule, larger yields are not available.

The concentration of total dissolved solids does not exceed 299 mg/l in any of 42 water samples collected from both belts. pH values of 80 percent of the samples fall within the 6.0 - 7.4 range. There are more wells with pH of 8.0 or higher in this unit than in any other unit in Albemarle County. Hardness was at or below 120 mg/l in 93 percent of the 54 samples collected. The remaining seven percent were in the 121 - 180 mg/l, or "hard" range. Wells with "hard" water are scattered and not in any particular area. Iron is seldom a problem in this unit; 67 percent of the samples registered concentrations at or below the 0.3 mg/l Virginia Department of Health drinking water limit. The majority of the remaining wells showed concentrations of less than 1.0 mg/l. As a rule, the high iron concentrations were found in the central portions of each belt, but not to the exclusion of a sizable number of low-concentration samples.

Cataclastic and Metasedimentary Rocks

This hydrogeolic unit (Plate 20) consists of a northeast-southwest-trending belt which underlies Free Union, Crozet, and Brownsville. Rock types included in this unit are mylonite, protomylonite, gneiss and conglomerate.

As a general rule, low to moderate yields are available in this unit. The vast majority of wells developed here produce less than 20 gpm (1.3 l/s); 56 percent are rated below 10 gpm (0.6 l/s). The relatively low yields may be a product of well depth, since wells in this unit tend to be somewhat more shallow than wells in other hydrogeologic units in Albemarle County.

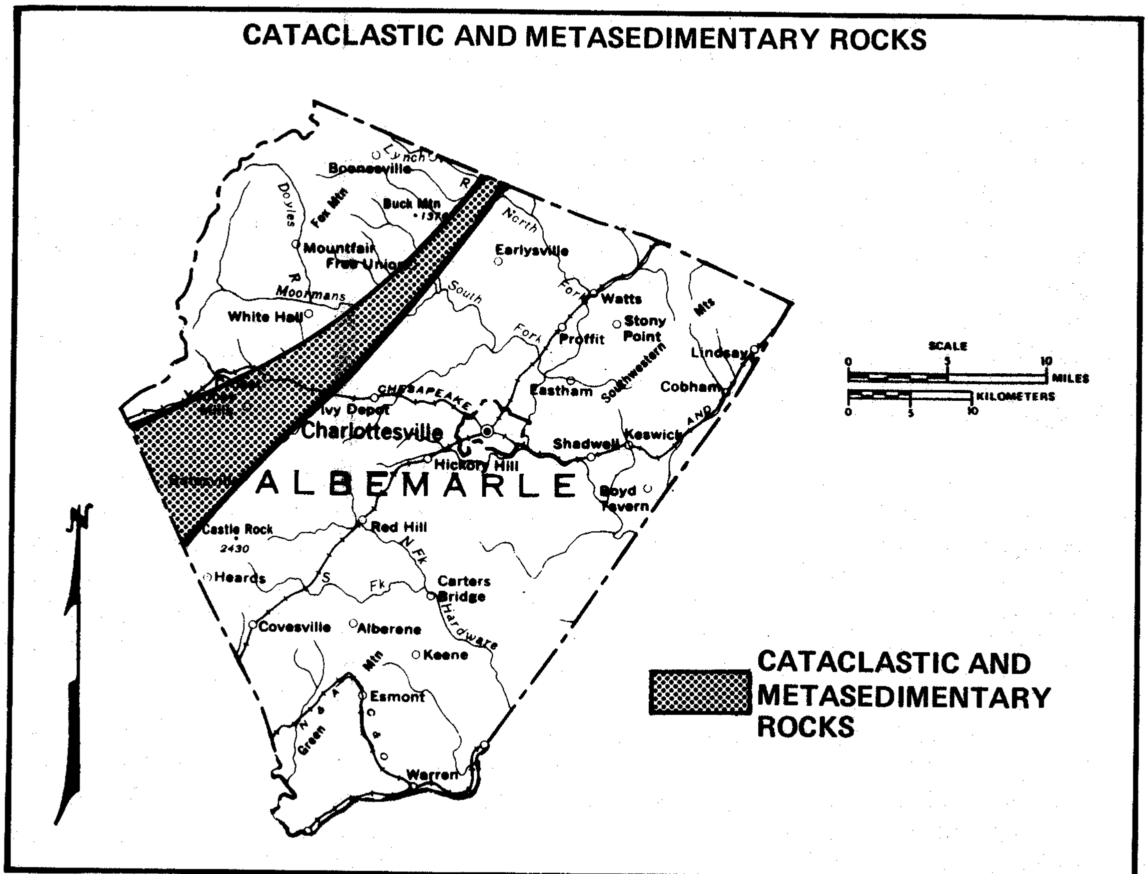
Of the 11 wells rated 20 gpm (1.3 l/s) or higher, six are rated at 30 gpm (1.9 l/s) or less. The notable exceptions are wells drilled for Morton Frozen Foods Division of ITT Continental Baking Company at Crozet. Of the three wells presently in use, two have been tested at 80 gpm (5.0 l/s), and the third was tested at 137 gpm (8.6 l/s). The two 80-gpm (5.0-l/s) wells, at 902 feet (275 m) and 1,100 feet (335m), are the deepest wells known in Albemarle County. Well #4 (211) encountered water-producing intervals at 745 to 752 feet (227 to 229 m) and 840 to 850 feet (256 to 259 m). Well #5 (674) encountered water zones at 1,040 feet (317 m) and 1,070 feet (326 m).

Water from the cataclastic and metasedimentary rocks is lower in mineralization than ground water found in any other part of Albemarle County. Ninety-three percent of all water samples collected from this unit showed total dissolved solids below 150 mg/l. Most samples were measured at 50 mg/l or higher. Ground water from these rocks tends to be slightly acidic. Seventy-six percent of quality analyses showed water with pH below 7.0; 17 percent were below pH of 6.0. This is characteristic of the light-colored rock types, such as gneiss, found throughout this hydrogeologic unit.

Ground water hardness, iron and manganese concentrations in this unit are very low. Over 80 percent of the wells drilled in this belt produce water classified "soft" (less than 60 mg/l hardness). Of the remaining wells, all but one encountered "moderately hard" water (61 to 120 mg/l hardness). The lone exception, the Morton #4 well (211), was analyzed at 121 mg/l. This is probably attributable to the increased contact time between ground water and rock since this well taps deep water zones. Eighty-one percent of the water samples were below the 0.3 mg/l Virginia Department of Health limit for iron, and 92 percent were within the 0.05 mg/l limit for manganese. No well sampled in this unit had a manganese concentration above 0.5 mg/l.

GROUND WATER UTILIZATION

Ground water usage in Albemarle County approaches three million gallons per day (11,355 m^3/d). Approximately 47 percent of the county's



CATACLASTIC AND METASEDIMENTARY ROCKS

Source: Virginia State Water Control Board – VRO

PLATE NO. 20

population is supplied by ground water. These estimates are based on pumpage records for public and industrial ground water systems, and calculations of domestic withdrawal based on population projections. Plate 21 lists the 20 largest ground water systems, based on average daily withdrawals, and their locations.

Domestic Ground Water Use

Individual domestic water systems account for about two-thirds of the daily ground water withdrawals in Albemarle County. A recent water supply needs assessment conducted by the State Water Control Board identified 50.9 percent of the county's 54,400 residents as being supplied by the Albemarle County Service Authority, which purchases water from the Rivanna Water and Sewer Authority. It is estimated that approximately two percent of the population utilizes cisterns as a water source. Therefore, approximately 25,500 county residents are supplied by individual ground water supplies, including both wells and springs. Based on an average of 50-75 gallons per day (0.19-0.28 m^3/d) per person, daily withdrawals may be nearly two million gallons per day (7,570 m^3/d).

Public Ground Water Use

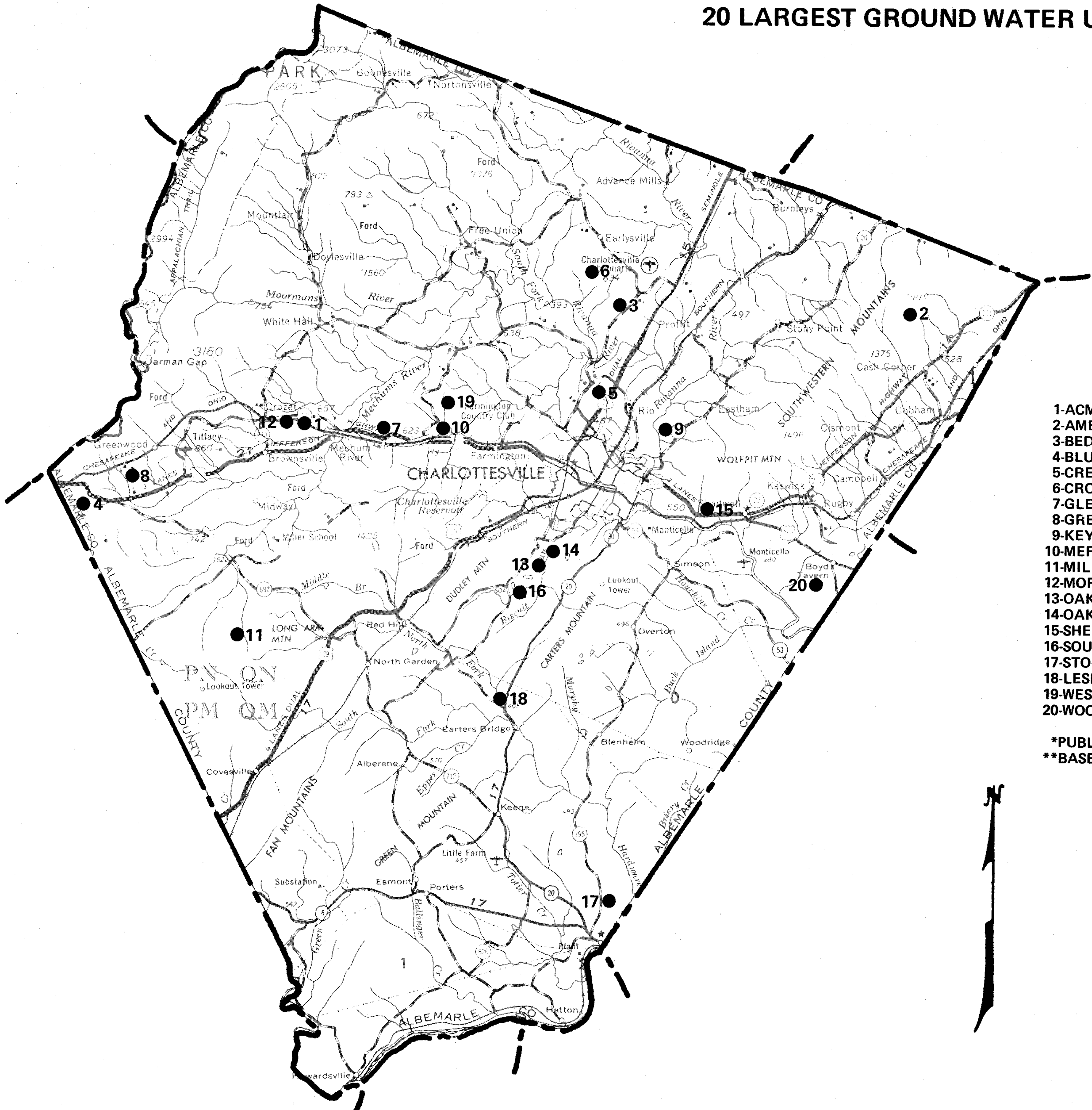
According to information gathered by the Board, average daily pumpage from 47 public water systems (19 community and 28 non-community) is in excess of 500,000 gpd (1,893 m^3/d). As defined by the Virginia Department of Health (1977), community water systems serve at least 15 service connections used by year-round residents or regularly service at least 25 year-round residents. Community systems include municipalities, communities, subdivisions, housing developments, trailer parks, etc. The largest community systems in Albemarle County withdraw around 50,000 gpd (189 m^3/d), while the smallest systems use less than 500 gpd (1.9 m^3/d).

A non-community water system is a waterworks which is not a community system but which operates at least 60 days out of the year (Virginia Department of Health, 1977). Establishments such as schools, motels, restaurants and campgrounds account for approximately 80,000 gpd (303 m^3/d). Four industrial ground water systems which supply potable water account for nearly 180,000 gpd (681 m^3/d), or 70 percent of the daily non-community pumpage.

The well field supplying Morton Frozen Foods consists of three active wells (Plate 22) and three abandoned wells. Approximately 20 percent of Morton's total plant water use, based on quarterly averages, is ground water, and two wells are capable of meeting these demands. Well #2 (269) and well #5 (674) are the main production wells. Well #4 (211) is used in an auxiliary capacity, usually in place of well #2. Pumpage from well #2 for the period 1977-1979 averaged 51,758 gallons (196 m^3) per operating day, and pumpage from well #5 for the same period averaged 57,855 gallons (219 m^3) per operating day.

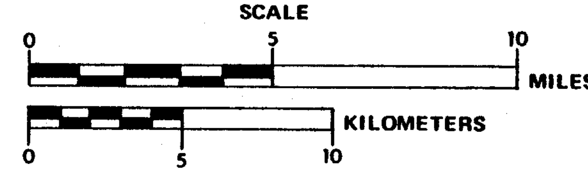
The three active wells each have been tested at 80 gpm (5.0 l/s) or greater. Well #2, 556 feet (169 m) deep, was pump-tested at 137 gpm (8.6 l/s) for 10 hours and registered a 158-foot (55-m) drawdown. The static water level was 27 feet (8 m) on the completion date, December 8, 1958, and bedrock was encountered at 36 feet (11 m). Well #4, drilled in July 1963, is 902 feet (275 m) deep. Water zones were encountered at intervals of 745 to 752 feet (227 to 229 m), and 840 to 850 feet (256 to 259 m). A 72-hour pump test was run at 80 gpm (5.0 l/s), but no drawdown information is available. The static water level was 60 feet (18 m) below land surface, and bedrock at 40 feet (12 m). The #5 well, 1,100 feet (335 m) deep, is the deepest well known in Albemarle County. Water zones were tapped at 1,040 feet (317 m) and 1,070 feet (326 m), and pump tests were run at 37 gpm (2.3 l/s) and 80 gpm (5.0 l/s). No drawdowns were recorded for either test, but pump intakes reportedly were set at 500 feet (152 m) and 625 feet (191 m), respectively. The static water level was reported to be 263 feet (80 m) below land surface on the completion date in April, 1964. All three wells were constructed with 6-inch (152-mm) casing.

20 LARGEST GROUND WATER USERS IN ALBERMARLE COUNTY



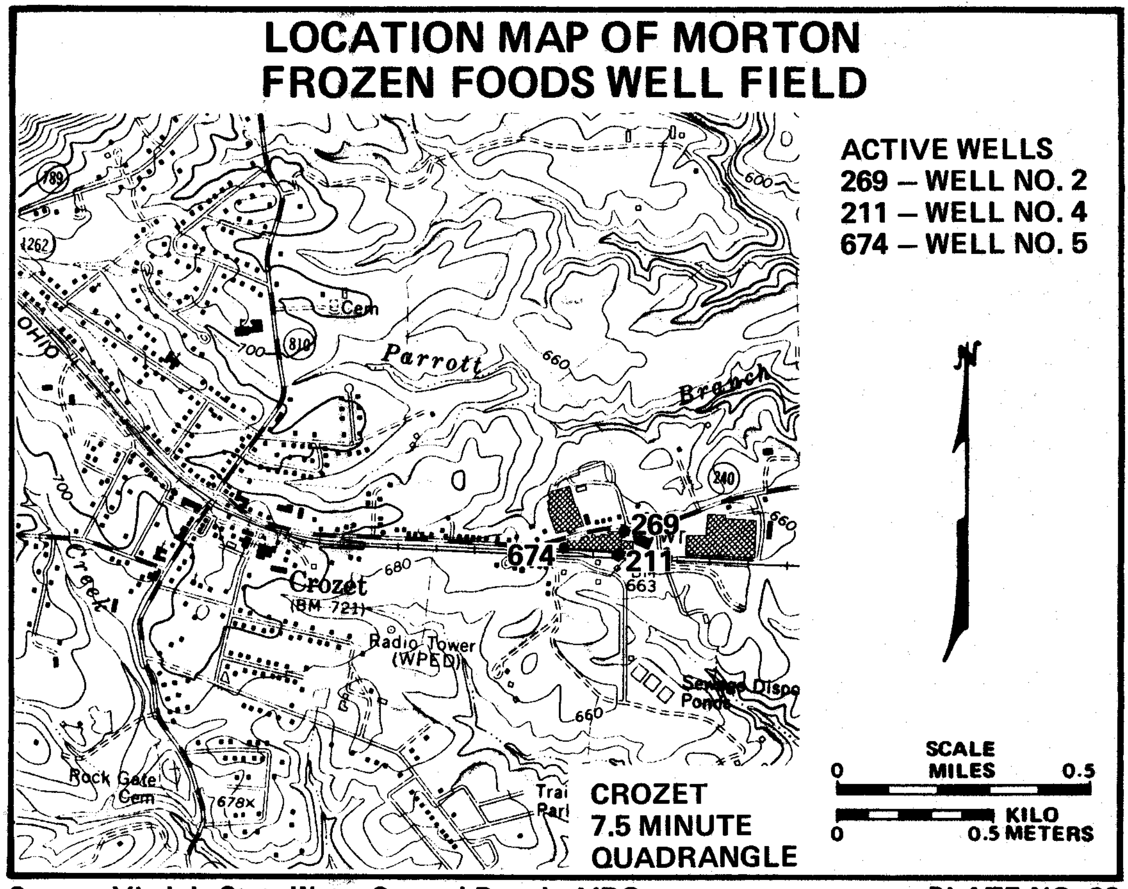
SYSTEM	SOURCE	DAILY WITHDRAWAL** gpd	m³/d
1-ACME VISIBLE RECORDS*	WELLS	52,316	198
2-AMERICAN TELEPHONE & TELEGRAPH	WELLS	11,000	42
3-BEDFORD HILLS*	WELL	9,035	34
4-BLUE RIDGE VENEER & PLYWOOD	WELL	48,000	182
5-CRENSHAW'S MOBILE CITY*	WELLS	22,400	85
6-CROUSE-HINDS*	WELLS	15,938	60
7-GLENAIRE*	WELLS	9,541	36
8-GREENWOOD CHEMICAL CO.	WELL	69,120	262
9-KEY WEST*	WELL	37,285	141
10-MERIWETHER HILLS*	WELLS	25,127	95
11-MILLER SCHOOL*	SPRINGS	24,000	91
12-MORTON FROZEN FOODS*	WELLS	117,954	446
13-OAKHILL*	WELLS	22,022	83
14-OAKHILL TRAILER PARK*	WELL	8,000	30
15-SHERATON INN EAST*	WELLS	11,000	42
16-SOUTHWOOD TRAILER PARK*	WELL	49,751	188
17-STONY POINT (RWSA)*	WELL	5,967	23
18-LESLIE H. WALTON MIDDLE SCHOOL*	WELL	9,000	34
19-WESTWOODS*	WELL	9,932	38
20-WOODSEDGE*	WELL	7,158	27

*PUBLIC WATER SYSTEM
**BASED ON HIGHEST AVERAGE DAILY WITHDRAWAL DURING 1978-79



Source: Virginia State Water Control Board – VRO

PLATE NO. 21



Source: Virginia State Water Control Board –VRO PLATE NO. 22

The abandoned wells, #1 (103), #3 (87), and #6 (210), range in depth from 368 to 625 feet (112 to 191 m) with reported yields ranging from 0.5 to 90 gpm (0.03 to 5.7 l/s).

Industrial Ground Water Use

Those industrial ground water systems which are not considered public water systems utilize approximately 90,000 gpd (340 m^3/d). Blue Ridge Veneer and Plywood consistently uses nearly 50,000 gpd (189 m^3/d), while Greenwood Chemical Company at Greenwood has recorded ground water withdrawals in excess of 69,000 gpd (261 m^3/d).

PROTECTION AND CONSERVATION OF GROUND WATER

Ground Water Quality Protection

Protecting the quality of the ground water resources of an area is of prime importance. Ground water pollution exists when foreign matter of any nature enters the ground water system and alters the natural quality. Water percolating downward through soil can be purged of harmful constituents before it reaches the ground water reservoir. However, if contaminants do enter the ground water reservoir, the chances of the aquifer system cleansing itself are very slight.

The degree of natural purification of water as it moves through soil depends on the soil type, size, and shape of the individual soil particles, thickness of the soil material, rate of percolation, and type and degree of contamination. Pollutants may be removed by mechanical straining and settling out between individual soil particles. Chemical changes in the soil may also account for significant contaminant removal. The rate of percolation determines the contact time water has with the soil. A soil whose percolation rate is rapid may not allow sufficient contact time for the mechanical and chemical processes to act effectively in contaminant removal. Further, if a soil zone is too thin to purify the water percolating through it, contaminated water may enter the aquifer.

While no major areas of ground water contamination have been identified in Albemarle County, local contamination problems occasionally do occur. Potential sources of ground water contamination include septic drainfields, spillage and leakage of petroleum products and hazardous chemicals, leakage from sanitary landfills and waste treatment lagoons, and agricultural runoff from croplands, barnyards and feedlots.

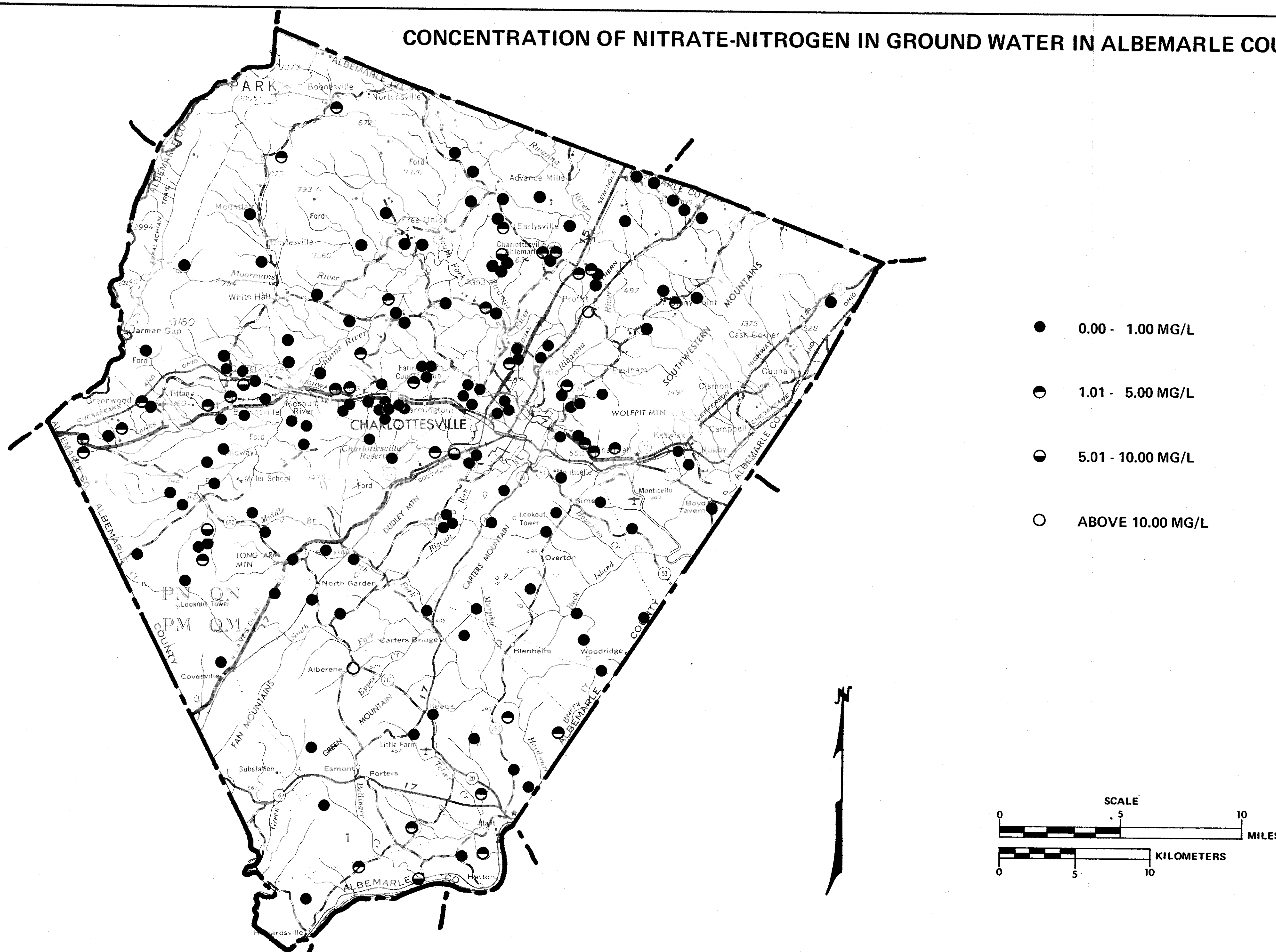
Septic tanks are the most common form of on-site waste disposal system in use in the United States today. The number of residents served by septic tank systems in Albemarle County is in excess of 25,000. Septic tanks utilize anaerobic bacteria to treat wastewater by digesting organic materials and separating sludge and scum from the water. Wastes which cannot be digested are treated by the soil as the wastewater drains from the tank into the soil absorption field. When absorption fields are constructed properly and located in adequate soil, pollutants can be removed from the wastewater as it filters through the soil.

Up to two million gallons (7,570 m^3) of water per day are returned to the soil in this manner each day in Albemarle County. A portion of this water eventually reaches the zone of saturation and becomes ground water. If the drainfield has been poorly designed or constructed improperly, contaminating substances such as nitrates, phosphates, bacteria and viruses may enter the ground water system.

Rainfall runoff from agricultural lands may be a source of nitrate contamination derived from fertilizers. Herbicides and pesticides may be present in runoff from croplands. Runoff from barnyards and feedlots is a common source of bacterial and nitrate contamination.

Plate 23 depicts nitrate-nitrogen values at more than 165 sampling sites in Albemarle County. The majority of the values are below 1.0 mg/1, though values up to 5.0 mg/1 are common along U.S. Route 250 all across

CONCENTRATION OF NITRATE-NITROGEN IN GROUND WATER IN ALBEMARLE COUNTY



Source: Virginia State Water Control Board — VRO

PLATE NO. 23

the county, and also in the vicinity of Scottsville. Only two sampling points showed nitrate values in excess of 10.0 mg/l, the limit established by the Virginia Department of Health. The scarcity of data precludes determing whether or not the high nitrate values are attributable to septic drainfields and agricultural practices.

Hydrocarbon contamination caused by spillage and leakage of petroleum products has been reported in several areas of Albemarle County. Minute amounts of petroleum in ground water may cause foul tastes and offensive odors. Occasionally the water returns to a normal state in a reasonable time if the source can be identified and eliminated. In many cases, however, it is impossible to determine the source of the contamination because petroleum products undergo changes once they come in contact with rocks and soil. Even where a source can be identified and removed, objectionable residual effects may be noticeable for decades. Clean-up operations usually are inadequate and can be prohibitively expensive.

Most of the petroleum contamination incidents reported in Albemarle County have involved leakage from underground gasoline storage tanks which have resulted in the contamination of a few domestic wells. The effects of these underground spills potentially may spread and adversely affect ground water quality over a larger area.

Sanitary landfills and waste treatment facilities are potential sources of ground water contamination. Industrial wastes often contain heavy metals which can be highly toxic in sufficient quantities. Landfills produce leachate, a "grossly polluted liquid characterized by high concentrations of dissolved chemicals, chemical and biological demand, and hardness" (Zaporozec, 1974). The key to preventing pollution from these sources is responsible site selection, design, operation, and management of waste disposal facilities. Ground water monitoring is an effective method of identifying the presence, nature and extent of contamination. Albemarle County has exhibited no known ground water pollution from any waste disposal sites, although most facilities have been in operation for many years. This is due, at least in part, to the thick mantle of residual soils present in most areas of the county.

Ground Water Conservation

Responsible management of ground water withdrawal is the key to conservation and effective utilization of the resource. Overdrafting can cause a decline in local and regional water levels which, in turn, can create both temporary and permanent adverse affects.

A significant lowering of the water table can cause interference between wells and within well fields. Heavy pumpage from one or several wells may cause such a decline that water levels in nearby wells may be lowered below pump intakes. This necessitates lowering pump intakes and often requires drilling the well deeper or abandoning it altogether. Lowering the pumping level in a well also causes a reduction in the efficiency of the system.

Overdrafting of ground water is not a problem in Albemarle County. There have been no documented cases of well interference which can be attributed to pumpage from neighboring wells or well fields. Problems potentially may arise, however, if ground water development is pursued without regard to the hydrogeologic factors affecting the occurrence, movement and storage of water in this stage of the hydrologic cycle.

DRILLING A WELL IN ALBEMARLE COUNTY

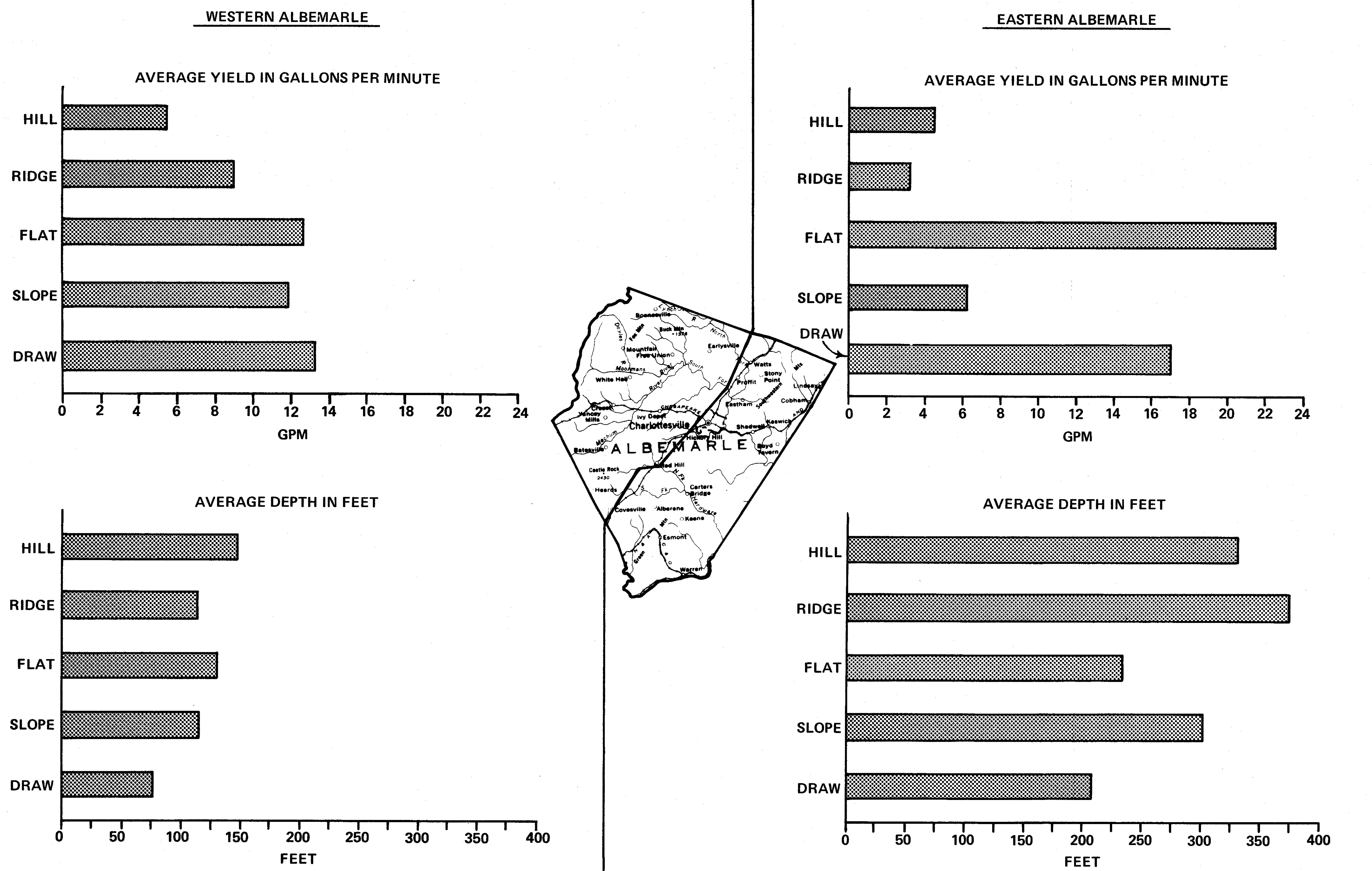
Selecting a Well Site

Locating a water well in Albemarle County by pure chance often can bring unsatisfactory results. "Dry holes" are not uncommon, but in many cases they can be avoided with a minimal amount of planning. Convenience and sanitation should be considered when selecting a well site. A well should be located convenient to the facility it is intended to supply, and it should allow easy access to both the well and pump for maintenance. Sanitation of the water supply is of utmost concern. The well should be located topographically above and an acceptable distance from septic drainfields, barnyards and feedlots, and other forms of surface and subsurface drainage. Never locate an unprotected well site in a natural drainageway, since surface water easily can pollute a well water supply.

Topography

Topographic setting seems to be the most important criterion in selecting a well site in Albemarle County. Auletta (1979) reports that greater potential yields are available in valleys, draws, and on slopes. Cross (1960) sites a 1954 report by LeGrand which states that topographic location of wells is the most important factor affecting well yields in the Piedmont of Virginia and North Carolina. Wells drilled at higher elevations, and especially on isolated hills in the central and eastern portions of the county, are far more likely to encounter insufficient quantities of water, or no water at all, than wells drilled in low-lying areas, especially at the base of a ridge or hill. Plate 24 graphically depicts the effect of topographic setting on well depth and yield in Albemarle County. The data from western Albemarle are from Cross (1960), while the data for eastern Albemarle have been compiled by the authors. The differences between the eastern and western data, especially the depth data, are significant. The most plausible explanation is that much of the earlier well information collected by the Board was selective and excluded most bored wells. Consequently, the major portion of the data used in compiling this information is based on bedrock wells. Technological advances over the past twenty years which have made drilling to greater depths a more feasible option also may partially

EFFECT OF TOPOGRAPHIC SETTING ON WELL DEPTH AND YIELD IN ALBEMARLE COUNTY



Source: Cross (1960)

Source: Virginia State Water Control Board —VRO

PLATE NO. 24

explain the differences between the two sets of data. While no results have been compiled, it appears that the authors' data for western Albemarle would show greatly increased average depths over those encountered by Cross. Regardless of the magnitude of the numbers, the trends are very similar and support the theory that drilling at topographic lows (i.e., draws and flats) generally results in greater quantities of water at lesser depths.

Fracture-Trace Mapping

Ground water production from rock types which traditionally have been regarded as poor aquifers may be increased significantly by the application of a ground water prospecting technique known as fracture-trace mapping. According to a recent report by the U.S. Department of the Interior (1978), wells located by the fracture-trace method consistently produce up to 50 times the average water production from a given rock type in a given area. Also, the chances of drilling an unproductive well are greatly minimized.

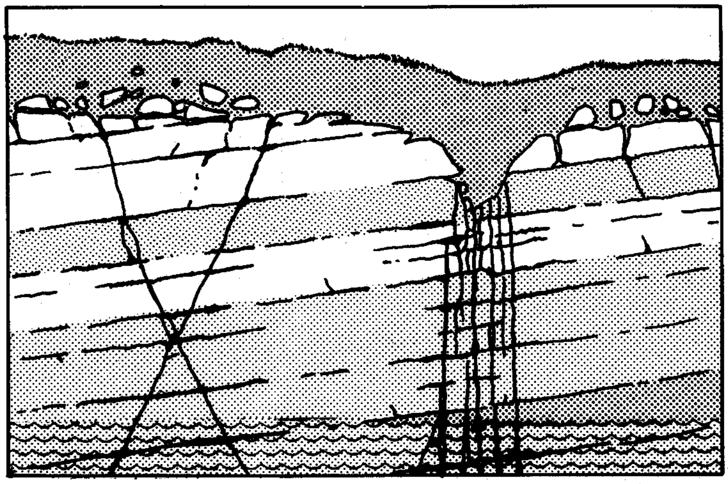
Fracture-trace mapping is highly applicable in Albemarle County since the rock types present here are dense and can store and transmit water only in fractures. A qualified hydrogeologist uses aerial photographs to map fracture traces. A fracture trace is the surface expression of a zone of structural weakness which may be identified by the alignment of valleys, vegetation types, sinkholes, or other surface depressions. Linear features of wet, or dark, soil in recently-plowed fields also may indicate a fracture zone. These zones may be as wide as 50 feet (15 m) and may be more than a mile (1.6 km) in length, and they may contain one or hundreds of fractures. The hydrogeologist pays particular attention to points where fracture zones intersect (Plate 25), since intersections represent zones of increased fracturing and, therefore, increase the probability of the presence of ground water in large quantities. After the aerial mapping has been completed, the hydrogeologist field-checks his findings and pinpoints a precise drilling site.

Fracture-trace mapping is more applicable to situations where large quantities of water are needed, as for industrial or municipal supplies. The method usually is not necessary or practical for domestic situations in Albemarle County. Yields sufficient for domestic use normally can be developed, and in many cases individual housing lots are so small that the fracture-trace mapping would be of little value.

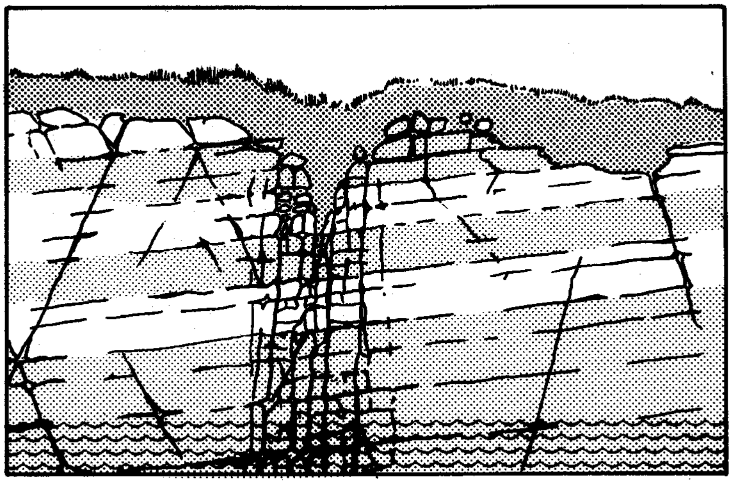
Types of Wells and Drilling Rigs

Two basic types of wells are commonly encountered in Albemarle County: drilled wells and bored or dug wells. Both types offer advantages and disadvantages to the consumer, depending on the geologic and hydrologic conditions of the site and the use for which the water is intended.

ZONES OF INCREASED FRACTURING MAY INDICATE GREATER GROUND WATER POTENTIAL



Model of a cross section of the earth's crust showing the fractures in a zone of fracture concentration.



Model of a cross section of the earth's crust showing the fractures at the intersection of two zones of fracture concentration. Note the increased number of fractures.

Source: Modified after U. S. Department of the Interior (1978) **PLATE NO. 25**

Bored and Dug Wells

Bored wells are best suited to domestic needs and can be easily developed in this county due to the thick saprolite (decomposed igneous and metamorphic rock) zone overlying bedrock. The terms "bored" and "dug" frequently are used interchangeably, but actually they refer to two different types of wells. Dug wells are constructed by hand, usually with a pick and shovel, are usually greater than 24 inches (610 mm) in diameter, and generally are shallow. They normally extend just a few feet (metres) below the water table and must be lined with stone, brick or concrete to prevent caving. The lining must be sealed to prevent contamination. Dug wells offer the advantages of being simple to construct and relatively inexpensive. However, they are difficult, if not impossible, to protect from contamination, and frequently go dry during periods of drought or during periods of heavy pumping.

Bored wells essentially are the same as dug wells except that they are constructed using hand or power augers. Bored wells seldom penetrate to depths greater than 100 feet (30 m). They generally are 24-30 inches (610-762 mm) in diameter, but may be as small as a few inches (millimetres) in diameter. Like dug wells, bored wells must be lined and sealed to prevent caving and contamination. They, too, are especially susceptible to fluctuating water tables and frequently go dry during periods of drought.

Drilled Wells

Drilled wells constitute the most common type of well found throughout Albemarle County. They normally are much deeper than bored wells and usually are no more than 6 to 8 inches (152 to 203 mm) in diameter for all but large public and industrial water supplies. Drilled wells may be constructed using either percussion or rotary techniques, or variations and combinations of the two.

Percussion, or cable-tool, drilling rigs penetrate through rock by alternate raising and lowering of a large bit attached to a steel cable. As the bit is lowered and strikes the bottom of the well, small chips of rock are dislodged and crushed. Cable-tool drilling offers the advantage of easy detection of water-bearing strata, since the slurry used to remove cuttings from the well normally does not seal off water zones. For this reason, wells drilled in this manner may not penetrate to depths as great as wells drilled by rotary methods, and the consumer may realize a substantial savings in per-foot (per-metre) charges. However, cable-tool rigs are capable of drilling only a few feet (metres) a day, so it usually involves a period of weeks to drill and develop a well by this method.

Rotary drilling rigs cut rock by the rotating action of the drill stem. As the drill stem turns in the hole, the bit cuts or crushes the rock, depending on the type of bit used. Rotary rigs are capable of drilling at much faster rates than percussion rigs, but it is sometimes difficult to identify a water-bearing zone because the fracture may be sealed off with drill cuttings or drilling fluid.

A hydraulic rotary rig uses water or a special "mud" formula as drilling fluid. The fluid is forced down the center of the drill pipe and blows across the bit onto the rock face. The fluid cools and cleans the bit, and removes rock chips from the rock surface so the cutting action of the bit will not be impeded. The cuttings and fluid are forced up the hole in the space surrounding the drill stem, thereby keeping the bore hole clear of debris.

An air rotary rig operates on much the same principle as the hydraulic rig, except that air is the drilling fluid. Roller bits, also used in hydraulic rotary situations, are common, as are down-hole hammers. A down-hole hammer is a tool similar to a pneumatic hammer which causes a percussion-type bit to pound the rock surface as the drill stem is rotating. The effect is a combination of rotary drilling and cable-tool drilling. Air rotary rigs are the type most commonly used in Albemarle County.

Increasing Well Storage

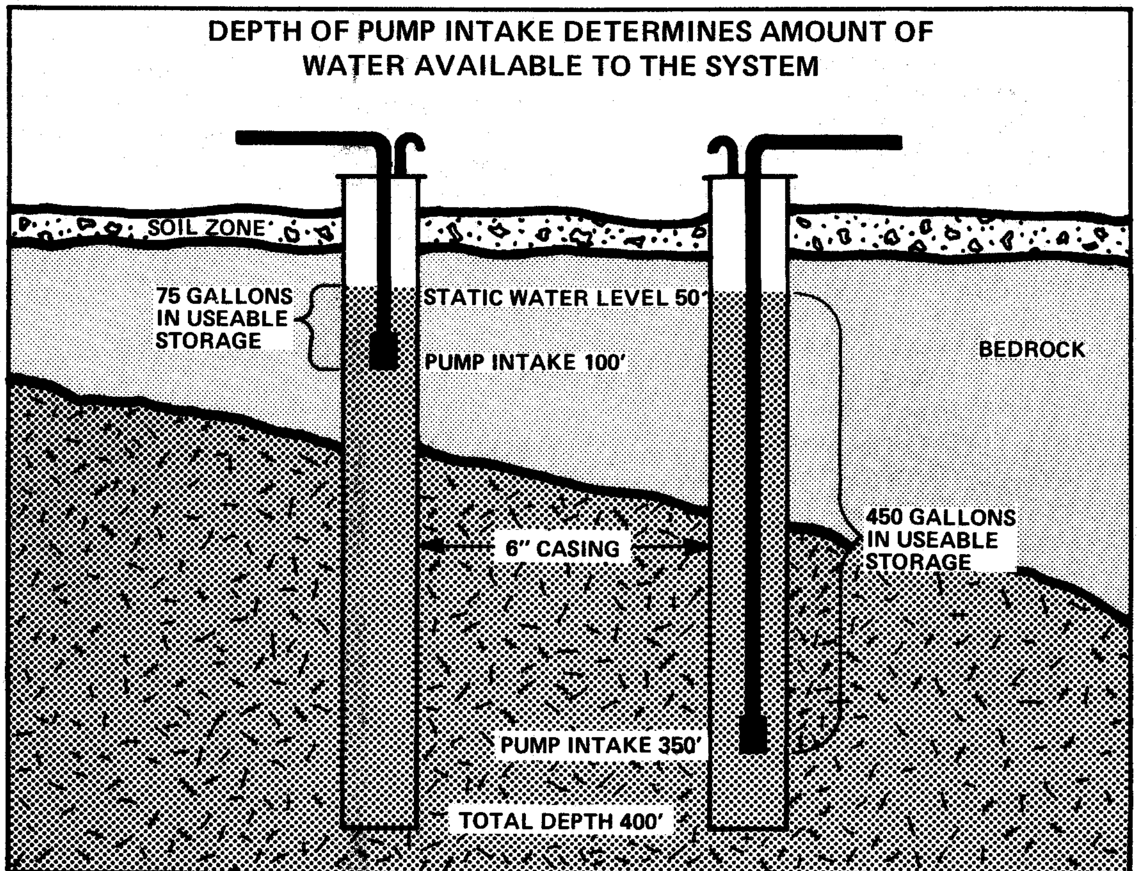
Well depth and diameter govern the volume of water storage available in a well. In cases where the yield is not sufficient to supply the consumer's needs, well storage can be increased by drilling a larger diameter hole and/or deepening the well. Table 3 gives per-foot water volume storage values for various well diameters.

TABLE 3

INFLUENCE OF CASING DIAMETER AND DEPTH ON WATER STORAGE

			Volume of water stored in water-filled casing length		
Nominal casing size	Inside diameter	Storage per linear ft.	50' section	75' section	100' section
4"	4.03"	0.66 gal	33 gal	49.5 gal	66 gal
5"	5.05"	1.04 gal	52 gal	78 gal	104 gal
6"	6.07"	1.50 gal	75 gal	113 gal	150 gal
8"	8.07"	2.66 gal	133 gal	200 gal	266 gal
10"	10.19"	4.24 gal	212 gal	318 gal	424 gal
12"	12.09"	5.96 gal	300 gal	447 gal	600 gal
14"	13.25"	7.16 gal	358 gal	537 gal	716 gal
15"	14.25"	8.29 gal	415 gal	622 gal	830 gal
16"	15.25"	9.49 gal	475 gal	712 gal	949 gal
18"	17.18"	12.05 gal	603 gal	904 gal	1206 gal
20"	19.18"	15.01 gal	751 gal	1126 gal	1501 gal

Source: Water Well Journal (1978)



Source: Virginia State Water Control Board — VRO PLATE NO. 26

The depth at which the pump intake is set determines the volume of water which can be used from well storage. If a pump intake is set at 100 feet (30 m) in a 400-foot (122-m), six-inch (152-mm) diameter well whose static water level is 50 feet (17 m), 75 gallons (0.28 m^3) of stored water will be available to the system. However, if the pump intake is set at 350 feet (107 m), 450 gallons (1.7 m^3) of stored water will be available to the system (Plate 26). The common problem of a well "going dry" during summer months usually is a matter of the water level dropping below the pump intake, while the well still has a significant amount of water remaining in it.

SUMMARY AND CONCLUSIONS

Adequate ground water supplies for domestic, public and industrial use can be developed in most areas of Albemarle County. Ground water quantity and quality are relatively consistent throughout the county, though differing geologic and topographic conditions result in some variation.

Topography is the most important criterion in selecting a well site in Albemarle County. The most productive wells normally have been drilled in draws and flats, and wells at these locations usually are drilled to lesser depths than those at other positions on the landscape. Several wells with yields up to 150 gpm (9.5 l/s) have been developed along the base of Carters Mountain and the Southwestern Mountains. Well yields in the southern half of the county are noticeably lower than those developed in the northern half of the county.

Wells located in the metavolcanic rocks comprising the Catoctin Formation appear to offer the best ground water potential in Albemarle County. Present development in the eastern belt suggests this area offers better potential than the belt extending along the east slopes of the Blue Ridge. Hardness of ground water from the metavolcanic rocks is greater than from any other rock types across the county.

Wells developed in the metasedimentary rocks in the eastern part of the county offer the lowest ground water potential. Over half of the wells produce less than 5 gpm (0.3 l/s), and water-bearing fractures generally are not encountered deeper than 200 feet (61 metres) below the land surface.

The most common form of ground water pollution in Albemarle County involves underground leakage of petroleum products. The reported cases have involved only one or a few wells. No areas of extensive ground water contamination have been identified.

Total ground water use throughout the county approaches 3 MGD. Approximately 47 percent of the county's population is supplied by ground water. Approximately 500,000 gpd (1,893 m^3/d) is withdrawn by public ground water systems. The largest ground water user, Morton Frozen Foods at Crozet, withdraws approximately 120,000 gpd (454 m^3/d). Industrial ground water use is relatively insignificant.

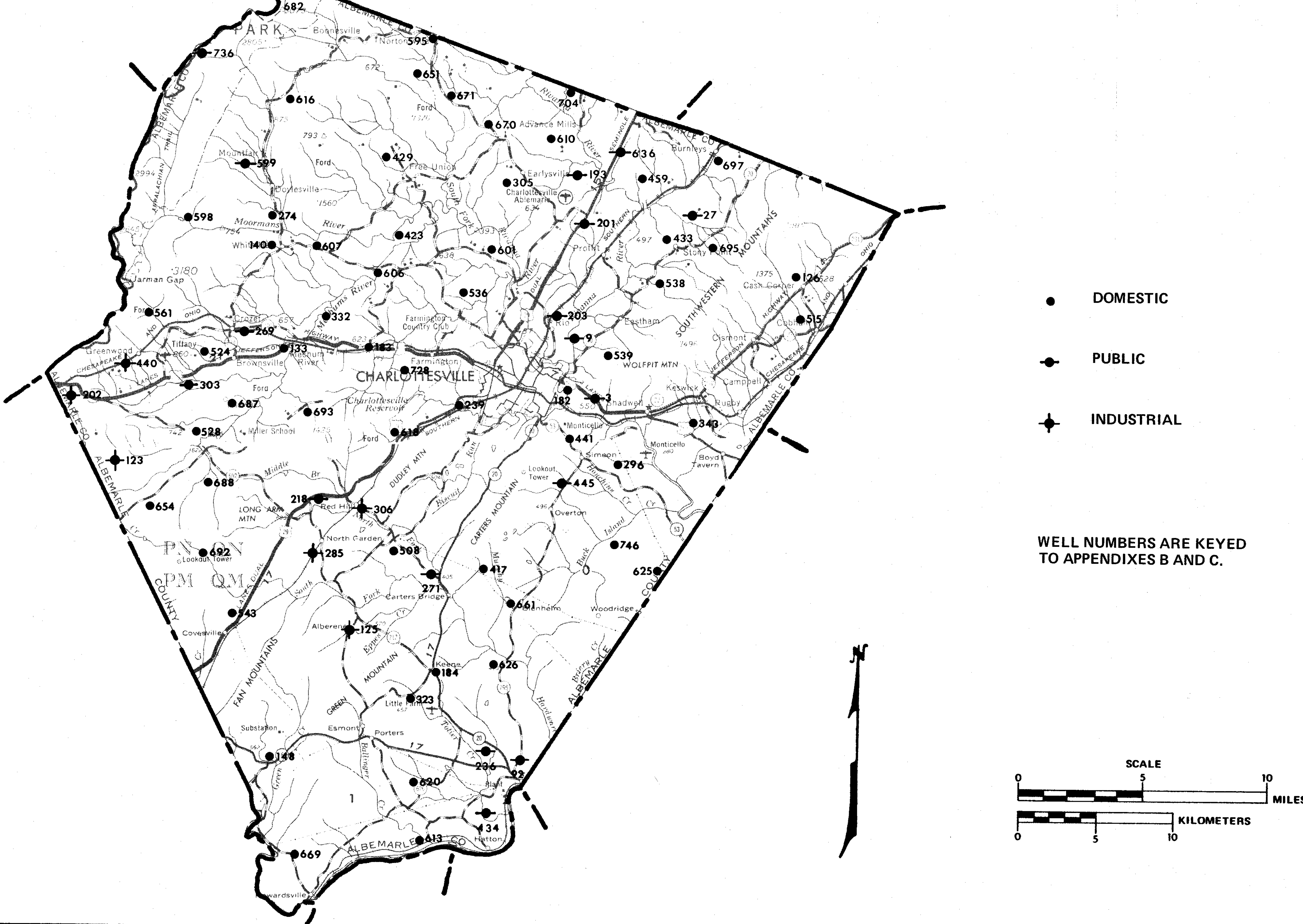
Ground water development for all types of water use, excepting some large industrial and public facilities, is possible in Albemarle County. Wells capable of producing in excess of 150 gpm (9.5 l/s) can likely be developed in many areas of the county, with priority being placed on the metavolcanic rocks of the Catoctin Formation. The Catoctin Formation consistently produces more water than any other formation in the county. By utilizing proven hydrogeologic prospecting techniques, such as fracture-trace analysis, high-yield wells of acceptable water quality can be developed in Albemarle County.

APPENDIX A

Ground Water Development in Albemarle County

The accompanying map (Plate 27) shows locations of approximately 90 selected wells throughout the county. The wells shown on Plate 27 may be cross-referenced with Appendixes B and C for well construction data and ground water quality data, respectively.

SELECTED WATER WELLS IN ALBEMARLE COUNTY



APPENDIX B

Summary of Water Well Data for Albemarle County

The computer printout on the following pages lists basic construction and hydrologic data for nearly 600 wells and springs in Albemarle County. Many wells and springs included in this listing may be cross-referenced with Appendixes A and C.

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

****

THE FOLLOWING LIST OF WELL DATA SUMMARIZES BASIC DATA OBTAINED FROM WATER WELL COMPLETION REPORTS WHICH ARE ON PERMANENT FILE IN THE OFFICES OF THE VIRGINIA STATE WATER CONTROL BOARD. ADDITIONAL INFORMATION FOR MANY OF THE WELLS IS AVAILABLE AND CAN BE OBTAINED BY CONTACTING THE APPROPRIATE REGIONAL OFFICE OR THE BUREAU OF WATER CONTROL MANAGEMENT AT THE AGENCY HEADQUARTERS IN RICHMOND.

************ EXPLANATION OF PARAMETERS ************

SWCB NO: STATE WATER CONTROL BOARD NUMBER - A SEQUENTIAL NUMBERING SYSTEM USED WITHIN A COUNTY; WHEN REFERRING TO A SPECIFIC WELL USE THIS NUMBER

OWNER AND/OR PLACE: IDENTIFIES ORIGINAL OR CURRENT WELL OWNER AND/OR LOCATION OF WELL

YEAR COMP: YEAR IN WHICH WELL CONSTRUCTION WAS COMPLETED

LOG: TYPE OF LOG ON FILE FOR WELL; D = DRILLERS, E = ELECTRIC, G = GEOLOGIC

ELEV: ELEVATION - MEASURED IN FEET ABOVE MEAN SEA LEVEL

TOTAL DEPTH: TOTAL DEPTH DRILLED, IN FEET, WITH RESPECT TO LAND SURFACE

BEDROCK: DEPTH TO BEDROCK, IN FEET, WITH RESPECT TO LAND SURFACE

CASING: MAXIMUM AND MINIMUM DIAMETER OF CASING, IN INCHES, USED IN WELL

DEVEL ZONE: DEVELOPED ZONE - INTERVALS, IN FEET, WHERE AQUIFERS TAPPED AND/OR SCREENED

AQUIFER: WATER-BEARING UNIT; ABBREVIATIONS USED INDICATE GEOLOGIC AGE OF UNIT AND ARE CONSISTENT WITH "GEOLOGIC MAP OF VIRGINIA" (DIVISION OF MINERAL RESOURCES - 1963)

STATIC LEVEL: DEPTH, IN FEET, TO WATER WITH RESPECT TO LAND SURFACE; MEASUREMENTS TAKEN WHEN WELL IS NOT PUMPED AND ARE GENERALLY THOSE RECORDED ON COMPLETION DATE

YIELD: REPORTED OR MEASURED PRODUCTION, IN GALLONS PER MINUTE

DRAWDOWN: DIFFERENCE, IN FEET, BETWEEN STATIC LEVEL AND PUMPING LEVEL; I.E., REPORTED OR MEASURED DROP, IN FEET, IN WATER LEVEL DUE TO PUMPING

SPEC CAPAC: SPECIFIC CAPACITY - YIELD PER UNIT OF DRAWDOWN EXPRESSED AS GALLONS PER MINUTE PER FOOT OF DRAWDOWN

HRS: HOURS - DURATION OF PUMP TEST, IN HOURS, FROM WHICH THE PRECEDING THREE ITEMS WERE DERIVED

USE: USE OF WATER OR WELL UNDER CONSIDERATION; DOM = DOMESTIC, PUB = PUBLIC, GOV = GOVERNMENT, IND = INDUSTRIAL, COM = COMMERCIAL, INS = INSTITUTIONAL. ABD = ABANDONED, DST = DESTROYED. IRR = IRRIGATION, RCH = ARTIFICIAL RECHARGE

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

****

SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
1	CEDAR HILL TR PK #2	68	D		410	40	6		20	25	PCLYG	20	7				DST
2	KEARSARGE SUBDIVISION	61	E	600	575	50	6		550	554	PCLGR	100	25	75	.33	10	PUB
3	GLENORCHY SUB #3	59	E	560	177	27	6		62	63	CPCC	18	25	159	.15	48	PUB
4	JEFFERSON VILLAGE SUB	68	D	530	195	92	6		120	130	PCLYG	40	40	150	.26	2	ABD
5	WOODBROOK SUBDIV #2	66	D		291	34	6				PCLYG	20	60				ABD
6	BERKELEY SUBDIV #4	65	D		360	45	6		69	70	PCLGR	36	35	324	.10	2	ABD
7	GREENFIELDS SUBDIV	65		560	195	71	6		150	155	PCLGR	30	25				ABD
8	DEERWOOD SUBDIV #1	65		600	200	25	6		160	180	PCLGR	30	12	170	.07	8	ABD
9	KEY WEST SUBDIV #2	59	DEG		263	21	6		240	242	CPCS	19	137	198	.69	268	PUB
10	MILLER SCHOOL-SP #1			925							PCLGR		27				PUB
11	SPRINGFIELD SUBDIV #1	63	D		167	37	6		112	115	PCLYG	32	22				PUB
12	KNOLLWOOD WATER CO #2	59	D		321	67			160	161	PCR	55	40	300	.13	56	ABD
13	HESSIAN HILLS SUB #4	65			300	20	6		30	31	PCR	25	8				ABD
14	HESSIAN HILLS SUB #5	66			250	30	6		60	70	PCR	25	4				ABD
15	HESSIAN HILLS SUB #3	65	G		217		6		50	51	PCR		1				ABD
16	HESSIAN HILLS SUB #2	65			130						PCR		6				ABD
17	HESSIAN HILLS SUB #1	64	G		350	21	6		75	80	PCR	25	4				ABD
18	CEDAR HILL TR PK #4	68	D		340	40	6		40	50	PCLYG	40	2				DST
19	CEDAR HILL TR PK #3	68	D		260	38	6		40	50	PCLYG	30	1				DST
20	OAK HILL SUBDIV #1	67	D	460	300	30	6		50	57	PCCH	25	12			8	PUB
21	JOSEPH CONTE	69		580	375		6				CPCC	111					DOM
22	CROZET SAN DIST #4	63	DE		705	58	6		185	188	CGS	32	66	308	.21	24	ABD
23	CHARLES W COURT #2	69	D		260	20	6				CPCC		1				ABD
24	GLENORCHY SUBDIV #2	59	E		301	37	6				CPCC	28	8	272	.02	48	PUB
25	CEDAR HILL TR PK #1	68	D		350	30	6		20	30	PCLYG	30	1				ABD
26	STONY POINT SUBDIV #2	72	D	440	305	15	6				PCCH		1				PUB
27	STONY POINT SUBDIV #1	72	D	505	305	48	6				PCCH	45	3				PUB
28	KEY WEST-SWCB OBS #28	59	E	335	409	58	6				CPCS	16	1	393			GOV
29	MOOSE LODGE	72		390	300		6		30	35	CPCL		2				DOM
30	CHARLES W COURT #3	69	D	530	195	35	6		60	62	CPCC	30	10				DOM
31	KESWICK CNTRY CLUB #1	69	D	455	340	40	6		85	90	CPCL	15	5				ABD
32	KESWICK CNTRY CLUB #2	69	D	420	340	30	6		70	75	CPCL	10	22				PUB
33	I-64 REST AREA-WBL #1	69	D	690	240	58			90	95	PCLGR						DST
34	I-64 REST AREA-WBL #2	69	D	690	400	58	6		195	235	PCLGR	58	15	249	.06	16	PUB
35	ODYSSEY	69	D	520	520	35	6		35	40	CPCC		2				PUB
36	WOODBROOK SUBDIV #1			510	395		6		138	139	PCLYG		35	254	.13		ABD
37	WOODBROOK SUBDIV #3										PCLYG						ABD
38	MADISON CUMMINGS #1	78	D		310	17	6		70	71	PCLGR	50	1				DOM
39	MADISON CUMMINGS #2	78	D		110	15	6				PCLGR	20	6				DOM
40	BERKELEY SUBDIV #3	64			475		6		185	187	PCLGR	35	15	440	.03		ABD
41	COLTHURST FARMS	58	D	600	334	45					PCLGR	30	24	245	.09	24	ABD
42	OAK HILL SUBDIV #3	67	D	460	350	60	6		265	268	PCCH	25	25			8	PUB
43	MONTVUE SUBDIV #1	67	D		343	72	6				PCR	45	17	228	.07	48	ABD
44	CROZET SAN DIST #3	59	D		325	17	6		135	137	PCV	7	50	85	.58	2	ABD

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

****

SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
45	OAK HILL SUBDIV #2	67	D	440	300	17	6	91	94	PCCH	62	6				PUB
46	HESSIAN HILLS SUB #6	66			235	30	6	70	75	PCR	30	10				ABD
47	AT&T, PETERS MT #1	63	DE		200	55	6			CPCC	40	5	43	.11	27	ABD
48	AT&T, PETERS MT #2	64	DE		647	3	6			CPCC	65	1				ABD
49	AT&T, PETERS MT #3	63	DE	1200	354	27	6			CPCC		3				ABD
50	AT&T, PETERS MT #4	63		640	240	46	6			CPCC	97	30	120	.25	24	IND
51	CAMELOT SUBDIV #2	67			175	40	6	80	90	PCLGR	40	25			18	ABD
52	BERKELEY SUBDIV #5	66			485		6			PCLGR	30	20	455	.04		ABD
53	REAL ESTATE III #1	78	D		125	21	6			PCLGR	25	6				DOM
54	WHIPPOORWILL SUB #1	72	D	495	205	10	6	157	158	PCLGR	30	30			4	PUB
55	BEDFORD HILLS SUB #1	65			275	50		60	61	PCLGR	30	25			36	PUB
56	WEST LEIGH SUBDIV #2	62	D	490	400	30	6	385	386	PCLGR	55	12	245	.04	27	ABD
57	FLORDON SUBDIV #1	·59		475	320	15	6			PCLGR	42	18	231	.07	27	ABD
58	FLORDON SUBDIV #2	64		480	330	50	7	90	91	PCLGR		65				ABD
59	WEST LEIGH SUBDIV #1		D	490	345		6			PCLGR	35	15	290	.05		ABD
60	REAL ESTATE III #2	78	D		245	42	6			PCLGR	30	50				DOM
61	REAL ESTATE III #3	78	D		125	42	6			PCLGR	35	4				DOM
62	JOHN KAUFFMAN #1	78	D		305	39	6			PCV		15				DOM
63	JOHN KAUFFMAN #2	78	D		205	18	6	105	110	PCV	30	2				DOM
64	ARTHUR PESCH #1	78	D		305	59	6			PCV		1				DOM
65	ARTHUR PESCH #2	78	D		305	40	6	150	155	PCV	30	1				DOM
66	JAMES C TROGDON JR	78			245		6			CPCC	85	2				DOM
67	BILL GRIMM	77	D		165	65	6	140	145	PCLGR	20	4				DOM
68	GARRISON	77	D		150	88	6	125	130	PCLGR		6				DOM
69	H E SHIFFLETT	77	D		130	81	6	94	95	PCLGR	40	25				DOM
70	BREAUD	77	D		170	64	6	150	151	PCLGR	25	5				DOM
71	JOHN GIRDLER #1	77	D		170	9	6	148	150	AM		8				DOM
72	JOHN GIRDLER #2	77	D		100		6			CPCC	34	40				DOM
73	FRANK HEREFORD	77	D		130	18	6	73	75	PCLGR	30	3				DOM
74	WILCO SERVICE STATION	77	D		170	30	6	82	83	CPCC	50	10				COM
75	LARRY LAMB	77	D		105	27	6	60	61	PCV	20	15				DOM
76	RUSH SUBDIV #2	74			310		6			PCLGR	4	4				ABD
77	TOM FORLOINES #4		D		630	53	6	385	386	CPCL	20	60				PUB
78	BURTON COURT APTS	66			100					PCR		60				PUB
79	CRENSHAW'S MOBILE #1			540	90		6			PCLGR		10				PUB
80	CRENSHAW'S MOBILE #2			535	260		6			PCLGR		9				PUB
81	CRENSHAW'S MOBILE #3			545	96		6			PCLGR		9				PUB
82	GLENORCHY SUBDIV #1				103					CPCC		6				PUB
83	KEY WEST SUBDIV #3	77			425	20				CPCS	75	100	300	.33	72	PUB
84	LANGFORD FARMS SUB #1	77			345	38	6	75	76	PCLGR	20	37				PUB
85	HUNTER PERRY	44	D		166	78	6	85	160	PCLGR	44	25	31	.80		DOM
86	MERIWETHER HILLS #2				410		6			PCLGR						PUB
87	MORTON FROZEN FOOD #3	61	D	670	625	35	8	80	81	CGS	48	90	297	.30	40	ABD
88	OAK HILL TR PK #1				195		6			PCCH		25				PUB

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
89	PARK ROAD TR PK #1				155		6				CGS	50	15				PUB
90	PARK ROAD TR PK #2				145		6				CGS		7				PUB
91	SLEEPY HOLLOW TR PARK	71	D		305	95	6		105	115	CPCC	50	4				PUB
92	ACSA-STONY POINT	45	D	440	135	88	6				CPCL	17	25			7	PUB
93	TRIANGLE TR PK #1			520	400						PCLGR						PUB
94	TRIANGLE TR PK #2			530							PCLGR						PUB
95	TRIANGLE TR PK #3			520							PCLGR						PUB
96	MILLER SCHOOL-SP #2			1320							PCLGR						PUB
97	OVERLOOK MOTEL	63		420	110						CPCC						PUB
98	BROADUS WOOD SCH #3	43	D		450		6		80	90	PCLGR		1				ABD
99	BROADUS WOOD SCH #1			670	240		5				PCLGR	76	2				ABD
100	BROADUS WOOD SCH #2	43		670	507	43	6		80	120	PCLGR		1				ABD
101	VIRIDIA GALLERY REST			500	500						CPCM						PUB
102	PEACOCK HILL	75	D		670	33	6		145	150	PCLGR	50	12				PUB
103	MORTON FROZEN FOOD #1	58		665	368						CGS		15				ABD
104	PEKING TEA HOUSE			530	150						PCLGR						PUB
105	S G JOHNSON #1	78	D		845	20	6				CPCL	80	2				DOM
106	S G JOHNSON #2	78	D		550	52	6				CPCL	50	1				DOM
107	R A YANCEY LUMBER CRP										CGS						IND
108	STONE-ROBINSON SCHOOL			380							CPCL						PUB
109	BENJAMIN F YANCEY SCH			540							CPCL						PUB
110	BROADUS WOOD SCH #4	62			290	45	6		81	82	PCLGR	62	8	228	.03	10	PUB
111	VIRGINIA L MURRAY SCH										PCLGR						PUB
112	CROZET SAN DIST #1	55			365	45	10	8			PCV	7	165			72	ABD
113	CROZET SAN DIST #2	56			625	5	10				PCV	30	63	393	.16	12	ABD
114	CAMELOT SUBDIV #1	67			300	30			30	60	PCLGR	20	1				ABD
115	WEST LEIGH SUBDIV #3	65			404	55	7		168	173	PCLGR	81	23	323	.07		ABD
116	WEST LEIGH SUBDIV #4	65			429	63	7		79	80	PCLGR	50	28	379	.07		ABD
117	BEDFORD HILLS SUB #3	77	D		405	24	6		45	50	PCLGR	40					PUB
118	BEDFORD HILLS SUB #4	77	D		310	59	6		140	142	PCLGR	30	10				PUB
119	WOODBROOK SUBDIV #3	67	D		330	57	6		119	124	PCLYG	30	125				PUB
120	GENERAL E WATSON	40			301	40	6				CPCC	40	25	160	.15		DOM
121	VA FOREST SERVICE				150	40	6				PCR	60	15	5	3.00	8	DOM
122	CHARLOTTESVILLE ICE	11			422						PCCH		80				ABD
123	VA GREENHOUSES #2	66			700		6				CGS		6			10	IND
124	VA GREENHOUSES #3	66	D		300	9	6		19	20	CGS	2	3				IND
125	ALBERENE STONE CO	65			102		6				PCCH	20	9				IND
126	MRS E H AUGUSTUS	66			155		6		135	136	CPCC	45	150				DOM
127	ROTHWELL & CO	15	D		523	40	10		79	230	PCCH	15	100	78	1.28		ABD
128	VA LAND-KEGLEY FARM 1	64	D		245	37	6		30	37	PCLGR	28	100	217	.46	8	ABD
129	WAYTES	60			80				70	71	PCLGR		100				DOM
130	YANCEY ICE CO	16			834						CPCS		8				ABD
131	RED-LAND LAND CORP	14			272						PCCH		100				ABD
132	FEDERAL BUILDING				580		6				CPCC						PUB

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
133	J W CLAYTON	55	E	520	101	19	6				CPCM	15	12				DOM
134	J ELLIT	57	E	585	452	32					PCLGR	47	1				DOM
135	UVA AIR FIELD			295	300		6				CPCL	1	3				DOM
136	DR VEST		E	510	120	59					PCLGR	50	8				DOM
137	MERIWETHER LEWIS SCH	37		645	145	38	6				PCLGR		30				PUB
138	GORDON MARSHALL		E	540	73	30					PCLGR	18	2				DOM
139	EMERSON	57	E	680	184	47					PCLGR	105	10				DOM
140	J H SHIFFLET	57	E	700	140	67					CGS		2				DOM
141	REEVES	58	E	700	197	100					PCV	35	10				DOM
142	ADCOCK	58			124	38					PCV	7	6				DOM
143	IVY MOTOR COURT	52		570							PCLGR						PUB
144	RONALD L DAVIS			650	92						PCV						DOM
145	A E SHIFFLET			680							PCLGR						DOM
146	GREENWOOD MOTEL			580	140						CPCS		10				PUB
147	MARY VANDERPLOEG			375	90						TRN						DOM
148	C & R GROCERY			430	140						PCCH	40	5				COM
149	ELEVENTH HOUSE INN			1010	165		6		100	101	CPCS		20				PUB
152	LAIRD & CO #1				210						PCLGR		6				IND
158	ALBERENE STONE CORP	49	D	475	78	32	6		55	78	PCCH	40	7	76	.09	14	IND
164	JOS CONTE-COLLINA #1	73	D	350	405	65	6		150	151	CPCL	40	20				ABD
165	JOS CONTE-COLLINA #2	73	D		405	70	6		50	65	CPCL	45	7				ABD
168	TULL MANUFACTURING	73		695	165		6		90	91	PCLGR		8				IND
169	TIFFANY SUBDIV #1	69			320						PCP						ABD
170	TIFFANY SUBDIV #2	69			480						PCP		1				ABD
171	TIFFANY SUBDIV #3	70			360		6		120	130	PCP	40	6	305	.01	8	PUB
172	TIFFANY SUBDIV #4	70			550		6		160	210	PCP	50	7	485	.01	7	PUB
173	TIFFANY SUBDIV #5	70			600		6		500	570	PCP	60	8	525	.01	10	PUB
174	CUSHMAN VA CORP	62	DE	505	307	23	6		137	147	PCLGR	50	30	263	.11	27	ABD
175	GLENAIRE SUBDIV	72	E		246		6				PCLGR	50	15				ABD
176	UVA ANIMAL FARM	70	D		350	65	6		90	100	CPCC	40	1				DOM
177	LAKE REYNOVIA #2	68	DE	435	225	45	6		35	40	CPCS	70	2				PUB
178	LAKE REYNOVIA #3	70	D	445	195	12	6		35	40	CPCS	5	3				PUB
179	VDH-YANCEY MILLS HDQS	70		690	226		6				CGS	46	10	186	.05	3	DOM
180	VA LAND-KEGLEY FARM 2	70	D		220	30	6		83	84	PCLGR	35	50	185	.27	8	ABD
182	JIM PRICE CHEVROLET	71	D	430	305	40	6		50	55	CPCC	45	15				DOM
183	IVY FOOD MARKET	71	D	515	135	33	6		124	125	PCLGR	10	15				DOM
184	VDH-KEENE HDQRS	71	D	550	260		6		40	41	CPCL	30	3				DOM
186	JAMES E CRAIG	71	D	450	325		6		253	255	PCLGR	30	14				DOM
187	DETTOR,EDWARDS,MORRIS	71	D	700	205	60	6		90	95	PCLGR		10				IND
188	VDH-BOYD TAVERN #1	71	D	485	250	23	6				CPCL	40	1				ABD
189	VDH-BOYD TAVERN #2	71	D	445	205	45	6		48	55	CPCL	30	8				DOM
190	ALLEN WILEY #4	71			245	25	6		30	35	PCLYG		45				ABD
191	ALLEN WILEY #5	71			185		6		60	65	PCLYG	10	125				ABD
192	MERIWETHER HILLS #1	72		595	325	40	6		45	50	PCLGR	30	26			120	PUB

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

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SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
193	CHRIS GREENE LAKE #2	71	D	485	135	40	6	80	81	PCLGR	20	25				PUB
194	CHRIS GREENE LAKE #1	71	D		305	8	6	80	81	PCLGR	40	1				PUB
195	STROMBERG-CARLSON #1	71			250		6	90	120	PCLYG	60	50	140	.35	4	ABD
196	SHERATON INN #1	71		495	505	73	6	140	143	CPCC	65	7				PUB
197	SHERATON INN #2	72	D	475	205	65	6	80	82	CPCC	60	30				PUB
198	ALLEN WILEY #1	71			165	28	6	120	125	AM	25	15				ABD
199	ALLEN WILEY #2	71			275	20				AM						DST
200	ALLEN WILEY #3	71			205	20				AM						DST
201	AIRPORT MOTEL	71	D	550	305	83	6	138	140	PCLYG		5				PUB
202	BLUE RIDGE VENEER	54		940	114		6			CGS	90	60	24	2.50	8	IND
203	FAIRVIEW CLUB	65			275		6			PCCH	95	10			8	PUB
205	GLENAIRE SUBDIV #2	58			101					PCLGR		15			2	PUB
206	KNOLLWOOD SUBDIV #3									PCR						ABD
207	LAUREL HILLS SUBDIV	59			228		6	80	85	CGS	30					ABD
209	C R MOORE WELL DR CO	71	DE		225	30	6	22	23	CPCC	10	12				DOM
210	MORTON FROZEN FOOD #6	63		670	500	20	8	416	417	CGS	390	1				ABD
211	MORTON FROZEN FOOD #4	63	D	665	902	40	6	745	752	CGS	60	80			72	IND
212	NORTHFIELD SUBDIV #1	60		410	366		6			AM	30	30				ABD
213	NORTHFIELD SUBDIV #2	60		520	205		6	80	81	AM		40				ABD
214	DEERWOOD SUBDIV #2	67			175		6	85	86	PCLGR	30	15			6	ABD
215	VDH-BATESVILLE HDQ-SP			700						CPCM						DOM
217	RED HILL SCHOOL #1	72	D	705	365	30		280	285	PCLGR	100	4				DST
218	RED HILL SCHOOL #2	72	D	705	345	36	6	42	45	PCLGR	45	7				PUB
220	SHERATON INN #3	72	D	480	300	40	6	125	126	CPCC	30	8				PUB
221	SHERATON INN #4	72	D	505	300	70	6	180	181	CPCC	50	2				ABD
222	FOREST LODGE #1	72	D		305	40	6	70	80	PCCH	56	3				DST
223	FOREST LODGE #2	72	D		305	50	6	120	125	PCCH	40	100				PUB
224	FOREST LODGE #3	72	D		305	30	6	210	215	PCCH	10	100				PUB
225	FOREST LODGE #4	72			445		6	170	175	PCCH	40	6				DST
226	FOREST LODGE #5	72	D		305	20	6	118	120	PCCH	65	40				PUB
227	FOREST LODGE #6	72			305		6	100	110	PCCH		5				DST
228	FOREST LODGE #7	72			305		6			PCCH						DST
229	FOREST LODGE #8	72			305		6	40	45	PCCH		6				DST
232	WALTON MIDDLE SCH #1	73		445	305			40	41	CPCC		3				DST
233	WALTON MIDDLE SCH #2	73		445	445		6	45	46	CPCC		3				PUB
234	WALTON MIDDLE SCH #3	73		425	405			20	21	CPCC	20	5				DST
236	SCOTTSVILLE SCHOOL	73		390	405		6	90	110	TRN	30	15				PUB
237	SHERATON INN #5	73	D	475	405	40	6	195	196	CPCC		12				PUB
238	RT 20 TRAILER PK #2	73		605	305		6	64	66	CPCC		12				PUB
239	VA DIV FORESTRY #2	73	D	510	305	30	6	115	150	PCH	50	20				DOM
240	PEACOCK HILL SUB #1	73	D	780	445	41	6	74	75	PCLGR	30	8				PUB
241	RT 20 TRAILER PK #1	73	D	520	505	9	6			CPCC	20	1				ABD
242	RT 20 TRAILER PK #3	73		540	305		6			CPCC	25	4				PUB
243	PEACOCK HILL SUB #2	73		760	405			70	71	PCLGR	70	2				DST

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

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SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
244	PEACOCK HILL SUB #3	73		695	305		6	80	90	PCLGR	30	38			48	ABD
245	I J BREEDEN INC #1	62			225		6	150	182	PCCH	45	20	225	.08	24	PUB
246	GLENAIRE SUBDIV #2A	68		680	105					PCLGR		18			2	PUB
248	DR MARTIN C NETSKY	61		445	400		6			CPCC						DOM
249	GEORGE CASON-SP			430						CPCC						DOM
250	PEACOCK HILL SUB #5	74		665	450		6	360	380	PCLGR	30	28			72	ABD
251	PEACOCK HILL SUBDIV									PCLGR						ABD
252	PEACOCK HILL SUBDIV									PCLGR						ABD
255	ACME VISIBLE RECRD #1			665	239		8			CGS						PUB
256	ACME VISIBLE RECRD #2	54			721		8			CGS						PUB
257	ACME VISIBLE RECRD #3				252		8			CGS						PUB
258	BEDFORD HILLS SUB #2	67			260	40	6	200	220	PCLGR	40	35				PUB
261	CROUSE-HINDS #1	61	DE	600	385	90	6	60	61	PCLGR	25	20	205	.09	24	PUB
262	CROUSE-HINDS #2	62	DE	555	555	60	6			PCLGR	30	15	217	.06	24	PUB
263	CROUSE-HINDS #3	68	D		198	12	6	55	60	PCLGR	8	12				PUB
264	TELEDYNE AVIONICS #1	55		630	163	63	6			PCLGR						PUB
265	TELEDYNE AVIONICS #2	65		630	240					PCLGR						PUB
266	LYDIA CHISHOLM	71		545	95					PCCH		18				DOM
267	VA DIV FORESTRY #1	67		510	300		6	170	185	PCR	45	18				DOM
268	LAKE REYNOVIA #1	49		480	246					CPCS		20				PUB
269	MORTON FROZEN FOOD #2	58	DE	670	556	36	6	50	136	CGS	27	137	158	.86	10	PUB
270	WALTON MIDDLE SCH #4			440	300					CPCC		7				PUB
271	WALTON MIDDLE SCH #5	73		440	405					CPCC		70			48	PUB
273	EARL BEACH	74	D		130	33	6			CPCL	20	15				DOM
274	NANCY BISHOP	75	D	720	130	8	6	95	96	PCV	20	10				DOM
277	CENTENARY METH CHURCH	74	D		310	21	6	19	20	PCCH	50	2				DOM
279	SKIP GELLETLY	75	D		130	46	6	55	60	PCLGR	20	6				DOM
280	SKIP GELLETLY	75	D		130	46	6	60	65	PCLGR	25	5				DOM
281	SKIP GELLETLY	75	D		110	65	6	70	75	PCLGR	20	5				DOM
282	JAMES GERCKE	74	D		110	45	6	65	70	CEV	20	4				DOM
283	GOODMAN	74	D		310	35	6	25	26	CPCL	10	1				DOM
284	WILLIAM JARRELL	75	D		150	73	6	90	91	PCLGR	20	20				DOM
285	LAIRD & CO #2	75	D	640	250	45	6	60	65	PCLGR	25	6				IND
293	W C POWELL	74	D		130	66	6			CGS	30	25				DOM
296	ROSE HILL BAPT CHURCH	74	D	430	310	20	6			CPCL	50	1				DOM
300	JOHN R WOOD	74	D		70	39	6			PCV	20	12				DOM
303	SAFARI CAMPGROUND	74	D	640	310	12	6			CGS	50	2				PUB
305	GARY WILSON	75			246		6			PCLGR	60	6			4	DOM
306	S L WILLIAMSON CO INC	75	D	590	130	30	6	100	105	PCLGR	20	4				IND
308	WILLIAM EDWARDS	75	D		205	88	6	105	180	CGS	50	8				DOM
316	THOMAS HADON	75	D		310	5	6	65	70	CPCL	15	2				DOM
323	CRICKENBERGER	75	D	500	190	44	6	55	60	CPCL	20	2				DOM
324	MONTICELLO HOME LOT 8	75	D		130	47	6	105	110	CPCL	20	5				DOM
325	MONTICELLO HOME	75	D		310	72	6	100	105	CPCL	40	1				DOM

VIRGINIA STATE WATER CONTROL BOARD

BUREAU OF WATER CONTROL MANAGEMENT

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
326	MR MURCH	75	D		90	62	6		80	85	CPCL	20	20				DOM
327	BETTY POWELL	75	D	620	110	37	6		65	70	CGS	30	12				DOM
331	SPROUSE	75	D		110	62	6		80	85	CEV	30	12				DOM
332	C M THACH	75	D	700	190	63	6		75	80	CPCM	35	7				DOM
333	DR JOHN YOUEL	75	D	585	250	34	6		140	145	PCLGR	40	45				DOM
334	IVY LANDFILL	75	D		225	18	6		55	175	PCLGR	3	60				DOM
335	GEORGE L BAILEY	75	D		90	84	6		85	90	PCCH	30	50				DOM
343	DOUG MILLER	75	D	400	310	40	6		150	155	CPCL	30	8				DOM
345	MONTICELLO HOME LOT 3	75	D		310	25	6		50	55	CPCL	40	1				DOM
346	MONTICELLO HOME LOT 5	75	D		190	22	6		30	35	CPCL	40	2				DOM
347	MONTICELLO HOME LOT 6	75	D		110	54	6		60	65	CPCL	40	8				DOM
348	MONTICELLO HOME LOT 7	75	D		310	30	6		55	60	CPCL	50	1				DOM
351	MONTICELLO HOME LOT 2	75	D		310	29	6		100	105	CPCL	20	2				DOM
356	JOHN MOORE	75	D		310	21	6		125	130	PCLYG	20	2				DOM
360	SHERATON INN #6	74	D	480	410	60	6		94	100	CPCC	85	20				PUB
367	BRUCE BROWN	74	D		310	70			80	120	CPCM	20	10				DOM
368	H M WITTKOP			1030	96						CPCS						DOM
369	I-64 REST AREA-EBL #1	75	D		205	23	6		55	205	CGS						PUB
372	WOODSEDGE SUBDIV #1	75	D		630	53	6		385	386	CPCL	20	41	250	.16	48	PUB
378	SEVEN-ELEVEN STORE	75	D		170	85	6		100	105	PCCH	30	3				ABD
381	MR A CRAIG	75	D		210	18	6				CPCC	20	100				DOM
382	WILLIAMS	75	D		310	46	6				PCLGR	70	1				DOM
385	JOHN MOORE	75	D		90	50	6		65	70	PCLGR	20	4				DOM
387	L L LIVELY JR	75	D	400	190	42	6		100	101	CPCL	40	4				DOM
389	VICTOR WOLFE	75	D		130	68	6		90	95	PCLGR	40	3				DOM
391	JAMES GERCKE	75	D		310	12	6		100	101	PCLGR	70	3				DOM
397	PRICE	75	D		210	12	6		35	40	CPCC	40	1				DOM
398	VASSEL	75	D		130	47	6		50	60	CPCL	20	15				DOM
403	MARY S THOMAS #1	75	D		350	17	6		40	45	PCR	70	1				DOM
404	MARY S THOMAS #2	75	D		350	40	6		100	105	PCLGR	50	1				DOM
407	DAVE TURNER #1	75			410		6				CPCL	4	50				ABD
408	DAVE TURNER #2	75	D		410		6		85	86	CPCL	3	5				ABD
409	DAVE TURNER	75	D		250		6		75	85	CPCL	5	50				ABD
412	MONTICELLO HOME	75	D		90	37	6		50	55	CGS	5	10				DOM
413	JAMES SADOWSKI	75	D	815	90	21	6		55	60	CGS	5	10				DOM
417	PETE THACKER	75	D		370	29	6		40	45	CPCC	30	2				DOM
418	DR STRASSER	75	D		290	60	6		275	280	CGS	60	15				DOM
421	MARIETTA WARS	76	D		130	95	6		99	100	PCLYG	50	12				DOM
423	DR DOUGLAS V NICOLL	76	D	540	195	24	6		27	28	CPCM	20	10				DOM
424	ROY SOUTHALL #1	76	D		270	28	6				CPCC						DOM
425	ROY SOUTHALL #2	76	D		510	20	6		119	120	CPCC	80	1				DOM
427	DICK BELL	75	D		170	70	6		150	155	PCLYG	40	1				DOM
429	JERRY TOMLIN	75	D	560	100	42	6		80	85	PCV	30	6				DOM
430	CARTER FIELD	75	D		230	32	6		35	40	PCLGR	10	8				DOM

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
431	JACK LOWE JR	75	D		170	27	6		125	130	PCLGR	30	30				DOM
432	JAMES M WEBBER	75	D		310	75	6		89	90	CGS	60	1				DOM
433	FLOYD HURT	75	D	510	130	72	6		80	85	PCCH	40	3				DOM
434	TOTIER CREEK PARK	75	D	335	310	21	6				CPCL						PUB
435	O'DONAHUE	75	D		270	12	6		79	80	PCP	40	5				DOM
439	GREENWOOD CHEMICAL #1			960			8				PCP						IND
440	GREENWOOD CHEMICAL #2			965							PCP						IND
441	H T PIPPIN	60		540	290		6				CPCC		10				DOM
442	C'VILLE AIRPORT				160						PCLGR	30	9				ABD
445	ASH LAWN	76	D	490	150	20	6		90	95	CPCC	50	100			48	PUB
447	MONTICELLO HOME	76	D		185	71	6		80	85	CGS	50	20				DOM
448	DR ORR	76	D		310	6	6		60	65	CPCL	30	2				DOM
451	DIRICKSON	76	D		190	8	6		85	90	CPCL	30	2				DOM
453	ANDERSON	76	D		90	36	6		40	45	PCLGR	30	6				DOM
457	GIBSON	76	D		310	30	6		90	95	PCLGR	70	1				DOM
458	ROBERT BLIZZARD #3	76	D		90	42	6		65	70	PCLGR	40	20				DOM
459	DR. RICHARD EDLICH	76	D	455	110	67	6		75	77	PCLYG	30	5				DOM
461	P STALLING	76	D		100	70			130	135	PCLGR	20	8				DOM
462	BOB CROSS	76	D		140	30	6		40	41	CPCM	50	4				DOM
469	RICHARD COGAN #1	76	D		225	50	6		110	115	PCV	30	6				DOM
470	TAYLOR WISE	76	D		180	65					PCLGR		1				DOM
474	DAVID GIBSON	76	D		250	42	6		225	226	PCLGR	50	15				DOM
476	L C PALMER	76	D		310	21	6		255	260	PCLGR	40	3				DOM
477	E BLAKE	76	D		230	57	6		165	170	CGS	30	3				DOM
479	H JAVOR GORDON	76	D		70	27	6		30	35	PCV	15	30				DOM
480	LEWIS E SCHOLLE	76	D		310	63	6				CPCL						DOM
482	CARTER DAVIS	76	D		170	84	6		100	105	CPCC	70	20				DOM
486	LINDSEY	76	D		310	49	6		65	70	CPCL	40	2				DOM
488	H T BROWNING JR #2	76	D		310	70	6				CPCL						DOM
489	DR TEATES	76	D		350	24	6				PCLYG	20	1				DOM
491	AYRES	76	D		185	51	6				CPCC	45	13				DOM
493	RUTH MORRIS	76	D		110	70	6				PCLGR	20	25				DOM
494	JOHN PAYNE	76	D		105	9	6				CPCL	30	4				DOM
500	AUTOMATED STRUCTURES	67									PCCH						PUB
501	MERIWETHER HILLS #3	76	D		585	33	6		240	246	PCLGR	140	18				PUB
502	DR REINISCH	77	D		105	105	6				PCLGR	80	70				DOM
503	WESTWOODS SUBDIV #1	76	D	625	510	30	6				PCLGR	6	4			2	ABD
504	WESTWOODS SUBDIV #2	76	D	620	500	33	6				PCLGR	7	3			2	ABD
505	WESTWOODS SUBDIV #3	76	D	560	400	33	6				PCLGR	9	21	336	.06	48	PUB
506	I-64 REST AREA-EBL #2	76	D		300	32	6		165	166	CGS	15	30				PUB
507	TOM MILIUS	76	D		210	18	6		95	100	CGS	40	4				DOM
508	HARDWARE BAPT CHURCH	76	D	560	110	8	6		65	70	PCJM	20	50				DOM
509	CRAWFORD #1	76	D		230	10	6				CPCL						DOM
510	CRAWFORD #2	76	D		170	10	6		65	70	CPCL	70	4				DOM

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
514	BURTON	76	D	640	310	32	6	170	171	PCLGR	40	1				DOM
515	HUGH MATLEY	76	D	490	150	30	6			CPCL	20	20				DOM
516	STEVEN L KEY	76	D		190	18	6	28	30	CGS	30	3				DOM
518	BURNLEY STATION	76	D	410	130	40	6	70	75	PCCH	20					DOM
522	MAGUSSUN	76	D		265	8	6	235	240	CPCL	30	8				DOM
524	W H WHITE III	76	D	725	190	90	6	150	152	CGS	30	3				DOM
525	PHIL RODGERS	76	D		110	34	6	60	63	PCLGR	40	12				DOM
526	MARSHALL	76	D		125		6			PCLGR	20	8				DOM
528	S C WEBB	76	D	690	130	70	6	85	90	CGS	40	4				DOM
529	MONTIE PRITCHETT #1	76	D		125	63	6	80	81	CGS	40	10				DOM
530	MONTIE PRITCHETT #2	76	D		125	25	6	170	175	CGS	20	8				DOM
531	CRENSHAW'S MOBILE CTY	76	D		510	58	6	80	85	PCLGR	40	8				PUB
536	FRANK SHEPARD	76		540	400	30	6	200	201	PCLGR		1				DOM
537	CALVIN TROGDEN	77			485	51	6	90	95	CPCC	60	2				DOM
538	POTTER	77	D	620	125	80	6	100	105	CPCC	30	20				DOM
539	RICK MILLER	77	D	520	125	51	6	90	95	CPCC	20	4				DOM
540	T HELVIN	77	D		185	103	6	170	175	PCLGR	40	5				DOM
541	DAVIS #1	77	D		110	43	6	55	60	PCLGR	40	10				DOM
542	HARRY BRANSON #1	77	D		110	72	6	78	80	CPCM	40	4				DOM
543	EDWARD HENDERSON	77	D	745	110	51	6	65	67	PCLGR	40	8				DOM
544	JOHN MOORE	77	D		190	20	6	170	172	PCLYG	30	3				DOM
545	THE PINES	77	D		110	52	6	55	58	PCLGR	20	50				PUB
548	TED ARMENTROUT	77	D		225	55	6	155	160	AM	30	4				DOM
550	LOUIS BURKETT	77	D		90	54	6	65	70	PCR		4				DOM
551	ANN WEBB	77	D		110	41	6			CEV		2				DOM
553	WALTER EADES	77	D		125	40	6			PCLGR	20	12				DOM
554	HENSLEY MORRIS #1	77	D		245	27	6			PCLGR		1				DOM
555	HENSLEY MORRIS #2	77	D		140	27	6	65	70	PCLGR	20	1				DOM
556	IVY FARMS SUBDIV	77	D		244	60	6	219	221	PCLGR	64	30	166	.18	48	PUB
557	WHIPPOORWILL SUB #3	77	D		319	55	6			PCLGR	30	15	319	.04	2	PUB
558	WHIPPOORWILL SUB #2	77	D		519	93	6	215	216	PCLGR	70	4	449		1	PUB
559	PANTOPS SUBDIV #1	77	D		419	40	6	131	133	CPCC	75	4	344	.01	1	ABD
560	PANTOPS SUBDIV #2	77	D		419	40	6	99	101	CPCC		50			1	ABD
561	DR ERNEST O ATTINGER	77	D	1190	210	60	6	150	151	CPCC	30	10				DOM
562	HARRY BRANSON #2	77	D		125	70	6			CPCM	20	12				DOM
563	JAMES BUTLER	77	D		310	17	6	110	111	CGS	30	1				DOM
564	CRICKENBERGER	77	D		185	80	6	160	165	PCCH	30	12				DOM
565	JIM COLEMAN	77	D		110	52	6	75	77	PCLGR		40				ABD
566	DOUBLE C CORP	77	D		305	85	6	245	250	CGS	30	3				DOM
568	HAMMOND	77	D		310	58	6	90	91	CPCS	40	1				DOM
569	HAWKINS	77	D		310	20	6			CPCL	75	1				DOM
570	DOROTHY HOUCHENS	77	D		225	15	6	200	205	CGS	45	6			1	DOM
571	JOHNNY JOHNSON-DIEHL	77	D		170	63	6	145	147	PCLGR	30	5				DOM
572	JOHNNY JOHNSON-MONGUS	77	D		190	73	6	165	166	PCLGR		3				DOM

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
574	CHUCK LASCANO	77	D		310	30	6		70	72	CPCS	30	3				DOM
575	LANNY MOORE	77	D		85	45	6		55	60	CPCL	27	10				DOM
576	NICOLL	77	D		110	16	6		30	31	CPCS	20	10				DOM
577	GEORGE PALMER II	77	D		230		6		190	192	CGS	20	6				DOM
578	PUGH	77	D		170	74	6		90	92	PCLGR	30	3				DOM
579	RAINES	77	D		305	63	6		225	226	CPCL		1				DOM
580	WILLIAM SHERWOOD	77	D		110	6	6		90	92	PCLGR	30	5				DOM
581	SPATES	77	D		240	42	6				PCV						DOM
584	WYANT	77	D		190	110	6		170	172	CPCS	40	15				DOM
585	MONTVUE SUBDIV #1A	67	D		385	75	6				PCR	17	15				ABD
588	VDH-SHADWELL HDQTRS			420							CPCC						DOM
589	VDH-FREE UNION HDQTRS			565							CGS						DOM
590	STONY POINT SCHOOL			540							CPCS						PUB
591	J P SADLER	76		475	70		6				PCCH		15				DOM
592	CHARLES WINGFIELD			685							CGS						DOM
593	DALE F ROLLINS	72		645	110		6				CGS		18				DOM
594	MONTY ROGERS			635			6				PCLGR						DOM
595	AUBREY ROACH	74		680	125	42	6				PCV		5				DOM
596	HAROLD L GIBSON			800							CPCS						DOM
597	DR R M MACLEOD			585							PCV						DOM
598	SUGAR HOLLOW DAM			900	155						PCV						DOM
599	MONTFAIR CAMPGROUND	66		830	250						CPCS		30				PUB
600	BRUCE PATTERSON	73		680	95						PCV						DOM
601	W W MORRIS	59		555	60		6				PCLGR		50				DOM
602	DAVID E MARSHALL			570							PCLGR						DOM
603	LUCK QUARRIES #1			325							CPCC						IND
604	GREENWOOD ELEM SCHOOL			850	190						PCP	30	17				PUB
605	H E GIBSON			630			6				PCLGR						DOM
606	DR C H FOX	73		450	65		6				CPCM						DOM
607	LUCILLE ENGLISH	68		640	120		6				CGS		20				DOM
608	HARRY DAWSON	76		625	93		6				PCLGR		18				DOM
609	HAROLD DAVIS	76		645			6				PCLGR						DOM
610	JAMES J BROWN JR	74		620	359		6		345	346	PCLGR		7				DOM
611	BEAVER CREEK RESERVR			570							CGS						PUB
612	ROBERT L RICE			455							TRN						DOM
613	M H MERCHANT	69		265	50						TRN		24				DOM
614	RICHARD HEETER										CPCS						DOM
615	GEORGE L HOWE										CPCL						DOM
616	WILLIAM RATUSNOCK	64		1020	110		6				PCV						DOM
617	WALLACE KENNEDY			645							CPCM						DOM
618	THOMAS C JOSEPH	65		555	125		6				PCLGR		5				DOM
619	R M WILBUR			420	100						TRN						DOM
620	E B MCCORMICK	72			155						TRN		3				DOM
621	JOHN H HAGA				80						CPCL						DOM

VIRGINIA STATE WATER CONTROL BOARD

BUREAU OF WATER CONTROL MANAGEMENT

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

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SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
622	BENNIE L LEAP	74		465	52		6			CPCL	26					DOM
623	M W JONES			465						PCCH						DOM
624	ALEASE HARRIS	57		460	30					TRN						DOM
625	CLEDIUS FIELDS	72		545	87		6			CPCL	12	5				DOM
626	LARKIN LONDEREE	53		475	100		6	65	66	CPCL		30			6	DOM
627	MEREDITH CLARK	77		665	255		6	155	156	CPCC		6				DOM
628	DOMINICK MOTORS	77	D		350	15	6	318	320	CPCC	100	20				DOM
629	DAVID C BREEDEN	77	D		210	70	6	170	172	PCCH	50	100				PUB
630	ROBERT PAGE	77	D		490	6	6	290	300	CPCC	100	3				DOM
631	MAUPIN	77	D		250	100	6	210	212	PCR	50	3				DOM
632	HERMAN SNOW	77			250		6			PCLYG	30	2				DOM
633	BILL CRUTCHFIELD	77	D		105	32	6	45	46	PCLGR	25	7				DOM
634	WALNUT LAWN FARM	77	D		170	91	6	125	130	PCV	30	20				DOM
635	JIM OGILVIE	77	D		210	75	6	110	112	CGS	40	4				DOM
636	PINEY MTN REST #2	64	DE		404		6	60	61	PCLYG	20	3				PUB
637	HENRY HARRIS	77	D		110	5	6	31	32	CPCM	20	20				DOM
639	MORRIS	77	D		105	21	6	45	46	PCCH	30	5				DOM
640	WILLIAM FONTAINE	77	D		170	52	6	65	66	PCP	15	2				DOM
641	BRUCE GORDEN #1	77	D		125	38	6	60	62	PCV	30	8				DOM
642	BRUCE GORDEN #2	77	D		305	64	6	145	146	PCV	30	3				DOM
643	CLIFF BURGH	77	D		83	57	6	70	83	CPCC	50	20				DOM
644	DON SWOFFORD	77	D		205	90	6	195	197	PCCH	40	25				DOM
645	HAZE	77	D		305	28	6	270	275	PCP	30	2				DOM
646	DICK MINTURN	77	D		145	94	6	120	122	PCLGR	30	6				DOM
647	JIM SNEAD	77	D		305					PCLGR		3				DOM
648	SPEASMAKER	77	D		305	62	6			PCV		5				DOM
649	C A DOWELL	77	D		110	52	6	70	71	PCP	30	7				DOM
650	MRS TURNER	77	D		148	85	6	105	106	CPCC	20	100				DOM
651	ZENA MORRIS	77	D		90	10	6	63	65	PCV	20	30				DOM
654	PAUL CLARK	77	D		110	21	6			PGG	30	5				DOM
655	JOE CHRISTAL #1	77	D		205	48	6			PCLGR	20	1				DOM
656	JOE CHRISTAL #2	77	D		125	69	6	90	95	PCLGR	30	6				DOM
657	MRS DUNN	77	D		305	36	6			PCLGR	50	1				DOM
658	EARL BEACH	77	D		305		6			CPCL		1				DOM
659	GREENWOOD CNTRY STORE	77	D		130	82	6	105	107	PCP	40	20				DOM
660	UNKNOWN	77	D		125	10	6	55	60	CPCL	20	3				DOM
661	LESLEY JONES	77	D		170	10	6	70	71	CPCL	60	10				DOM
662	D D HUDSON #1	77	D		305	21				CPCL						ABD
663	D D HUDSON #2	77	D		305	21				CPCL						ABD
664	STEPPE	77	D		230	16	6	70	72	PCV	40	2				DOM
665	YOUNG	77	D		125	18	6	90	95	PCP	20	20				DOM
666	CLARENCE HAWKINS	77	D		305	21	6			CPCL	8	2				DOM
667	UNKNOWN	77	D		245	65	6	100	105	CPCC	30	3				DOM
668	MRS REUBEN CLARK	77	D		110	30	6	65	66	PCLGR	30	25				DOM

V I R G I N I A   S T A T E   W A T E R   C O N T R O L   B O A R D

B U R E A U   O F   W A T E R   C O N T R O L   M A N A G E M E N T

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669	UNKNOWN	69		605	92		6			CPCL		5				DOM
670	O S BECK	65		600	175		6			CPCM		3				DOM
671	C E ROBERTS	72		605	185	50				PCV	30	6				DOM
672	G E HANEY	62		585	128		6			PCV		15				DOM
673	CATHERINE B NORVELL	25		685	125					PCLGR						DOM
674	MORTON FROZEN FOOD #5	64	DE	670	1100		6	1040	1041	CGS	263	80				PUB
675	WALTER CUSHMAN #1	63	E	560	94	58	6			PCLYG	24	15				DOM
676	H R PRITCHETT #1		E	350	82					CPCL	5					DOM
677	J C CHURCHILL #1	63	E	660	208		6			PCLGR	36	2				DOM
678	R E KIRBY #3	63	E	350	195	5	6	80	81	CPCL	21	2				DOM
679	R E KIRBY #1	63	E	360	175	16	6			CPCL	28	1				DOM
680	R E KIRBY #2	63	E	350	198	10	6		110	CPCL	20	1				DOM
681	W F KIRBY #2	62	E	380	351		5			CEV	269	1				DOM
682	SNP-LOFT MOUNTAIN #5	62	E	2700	320	10	6	53	54	CPCC	15	22	110	.20		PUB
683	SNP-LOFT MOUNTAIN #4	62	E	2700	240	65	6	38	39	CPCC	8	22				PUB
684	SNP-LOFT MOUNTAIN #1	62	E	2700	303	47	6	123	124	CPCC	10	20				PUB
685	ALLEN F VOSHELL JR #1	63	E	620	255	90	6	110	111	PCLGR	42	2				DOM
686	JIM-TEL BUILDERS #1	63	E	565	404	45	6	80	90	PCLGR	136	1				DOM
687	HOWARD WOOD	67		705	160					CGS		8				DOM
688	HOLMES BROWN	56		780	320		6			PCLGR		5				DOM
689	FRANK ELLIOTT						6			PCLGR						DOM
690	CROSSROADS STORE			695	75					PCLGR						DOM
691	R H DAWSON	70		720	85		6			PCLGR		10				DOM
692	JOSIE B MARTIN	75		1190	125		6			PCLGR		8				DOM
693	JAMES MORRIS	57		610	67		6			PCLGR		6				DOM
694	W W STEPHENSON	51		620	30		6			PCLGR	8					DOM
695	CECIL SMITH	62		540	89		6			CPCC		10				DOM
696	JIMMY HIGGINS			500						CPCC						DOM
697	C P MADISON	72		510	125		6	100	101	PCCH		12				DOM
698	FINLEY L RAGLAND	72		490	150		6			PCLYG						DOM
699	M G HENDERSON			685			6			PCLYG						DOM
700	EUGENE TUTTLE			545						CPCC						DOM
701	JAMES MAYNOR			400						CPCL						DOM
702	EDNA LOVING			535						CPCL						DOM
703	SAMUEL R THACKER			425			6			CPCL						DOM
704	DANIEL GARLAND	73		620	65	38	6			PCLGR		100				DOM
705	LACO BUILDERS	77	D		185	60	6	160	165	PCV	20	100				DOM
706	JOHN WOLFE	77	D		390	30	6	90	92	CGS	40	8				DOM
707	WALTER JAEGER		D		190	44	6			PCCH	30	4				DOM
708	HUNTER GRAVES	77	D		225	36	6			PCLGR	50	5				DOM
709	OLD KESWICK FARM	77	D		165	41	6	70	75	CPCC		100				DOM
710	G N SAEGMULLER	77	D		205	50	6	170	175	CPCL	20	50				DOM
712	RICHARD M BRANDT	77	D		125	43	6			CGS	20	6				DOM
713	PHIL SPEASMAKER	77	D		130	70	6	97	99	PCLGR	40	20				DOM

VIRGINIA STATE WATER CONTROL BOARD

BUREAU OF WATER CONTROL MANAGEMENT

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
715	M H HERRING	77	D		125	55	6	70	75	PCV	20	4				DOM
716	WILLIAM RUSH			560						CPCL						DOM
717	HANTLEY BRUSCOE			525						CPCL						DOM
718	PANTOPS RESTAURANT #1	69	E		519	20		35	40	CPCC	45	2				PUB
719	PANTOPS RESTAURANT #2	69	E		266	2				CPCC	27	1				PUB
720	EARLYSVILLE SHOP CNTR	68	E		565	66	6	80	85	PCLGR	60	16				PUB
722	DR. E D V NICOLL #3	68	E		501					CPCM	18	12				DOM
723	H L PETTEY #2	68	E		280	3	5	38	40	PCLGR	1	1				DOM
724	H L PETTEY #3	68	E		250	17	5	48	49	PCLGR	5	6				DOM
727	CREST ORCHARD SUB #1	60	E	740	525	92	6			PCLGR	35	1				ABD
728	JOHN ELLETT	60	E	560	376	18	6			PCLGR	7	1	376			DOM
729	WILLIAM E SPEERS	60	E	500	448	70	6		380	CPCC	93	4			16	DOM
730	VDH-FREE UNION HDQTRS	58	E	580	118	72				CGS	36	9				DOM
731	SHERWOOD FARMS SUB #1		E	480	200	20				PCLGR		15				DOM
732	SHERWOOD FARMS SUB #5	58	E	490	102	19				PCLGR	50	15				DOM
733	ALONZO RHINEHART #1		E	780	400					PCLGR						ABD
734	UVA HOSPITAL EXP ST#2	64	DEG		453	33	6	98	100		40	1				ABD
735	BURTON #1	58	E	500	170	31				PCLGR	31	3				DOM
736	SNP-DUNDO #1-TEST #3	64	E	2750	614					CPCL	358					PUB
737	DAN ELZROTH #1	78	D		145		6			PCLGR		35				IND
738	DAN ELZROTH #2	78	D		285		6			PCLGR		7				DOM
739	DAN ELZROTH #3	78	D		305		6			PCLGR						ABD
740	DAN ELZROTH #4	78	D		305		6			PCLGR		5				IND
741	RONALD AGEE #1	78	D		290	56	6			AM						ABD
742	RONALD AGEE #2	78	D		125	40	6	50	55	AM	20	5				DOM
743	CHRIS WALTERS	78	D		185	64	6	170	172	CGS		50				DOM
744	CALVIN BEALER	78			145		6			PCLGR		15				DOM
745	LUBY WILLIAMS	78	D		125		6			PCLGR		10				DOM
746	DALE TERRY	74		400	40		6			CPCL		10				DOM
747	J B ANDERSON	77	D		190	50	6	90	92	PCLGR	30	4				DOM
748	MILLER SCHOOL	77	D		285	31	6	100	105	PCLGR	100	5				ABD
749	BOBBY ARCHER	77	D		250	15	6			CPCC	40	2				DOM
750	STANLEY THOMAS #1	77	D		150	74	6	80	81	PCLGR	15	4				DOM
751	STANLEY THOMAS #2	77	D		250	66	6	75	77	PCLGR	10	2				DOM
752	DAVID KUDRAVETZ	77	D		145	71	6	104	105	CGS	30	4				DOM
753	HENRY HANSEN	77	D		185	48	6	100	105	PCV		5				DOM
754	LUCK QUARRIES INC	77	D		205	100	6	110	115	CPCC	30	15				IND
755	CECIL HIGGINS	78	D		105	10	6	45	46	CPCL		4				DOM
756	BRUCE THOMSON	78	D		125	85	6	98	99	CPCL		6				DOM
757	JIM BECK INC #1	78	D		305	10	6			CPCL						ABD
758	JIM BECK INC #2	78	D		185	10	6	130	131	CPCL		2				DOM
759	HENDERSON HEYWARD #1	78			405		6			CGS						DOM
760	HENDERSON HEYWARD #2	78	D		125	18	6	100	105	PCV	5	15				DOM
761	JOHN GIRDLER	78	D		125	51	6	54	55	PCLGR		10				DOM

VIRGINIA STATE WATER CONTROL BOARD

BUREAU OF WATER CONTROL MANAGEMENT

SUMMARY OF WATER WELL DATA FOR ALBEMARLE COUNTY

SWCB NO	OWNER AND/OR PLACE	YEAR COMP	LOG	ELEV	TOTAL DEPTH	BED-ROCK	CASING MAX	CASING MIN	DEVEL FROM	ZONE TO	AQUIFER	STATIC LEVEL	YIELD	DRAW DOWN	SPEC CAPAC	HRS	USE
762	SATO	78	D		125	60	6		80	85	PCV	20	20				DOM
763	RANDOLPH MAUPIN	78	D		165	100	6		115	120	CPCM	30	4				DOM
764	W D MAWYER	78	D		165	100	6		100	105	PCLGR	30	3				DOM
765	GEORGE CARTER	78	D		145	40	6		120	125	PCLGR	30	10				DOM
767	DAVE LANDIN										CPCC						DOM

APPENDIX C

Summary of Ground Water Quality Analyses for Albemarle County

The computer printout on the following pages lists over 200 basic ground water quality analyses for water samples collected from wells and springs in Albemarle County. All information in this printout may be cross-referenced with well construction and hydrologic data contained in Appendix B. Well locations for some analyses may be found on Plate 27, Appendix A. A discussion of the parameters may be found in Appendix D.

VIRGINIA STATE WATER CONTROL BOARD

********* EXPLANATION OF TABLE *********

THE VIRGINIA STATE WATER CONTROL BOARD MAINTAINS A FILE OF WATER-QUALITY ANALYSES OF GROUND WATER FROM SELECTED WELLS AND SPRINGS. THE FOLLOWING TABLE IS A SUMMARY OF THESE ANALYSES. ADDITIONAL INFORMATION IS AVAILABLE FOR MANY OF THESE WELLS AND SPRINGS AND CAN BE OBTAINED BY CONTACTING THE VALLEY REGIONAL OFFICE (703-828-2595) OR THE BUREAU OF SURVEILLANCE AND FIELD STUDIES (804-257-0386)

SWCB NO (STATE WATER CONTROL BOARD NUMBER): SEQUENTIAL NUMBER APPLIED TO WELLS WITH INFORMATION ON FILE. WHEN REQUESTING ADDITIONAL INFORMATION, PLEASE REFER TO THIS NUMBER.

OWNER AND/OR PLACE: ORIGINAL OR CURRENT OWNER OF THE WELL AND/OR ITS GEOGRAPHIC LOCATION.

DATE SAMP (DATE SAMPLED): MONTH AND YEAR IN WHICH THE WATER SAMPLE WAS COLLECTED.

PH: A PARAMETER WHICH INDICATES WHETHER WATER IS ACIDIC OR BASIC. A PH VALUE OF 7.0 INDICATES WATER WHICH IS NEUTRAL, A PH VALUE OF LESS THAN 7.0 INDICATES THAT WATER IS ACIDIC AND A PH VALUE OF GREATER THAN 7.0 INDICATES THAT WATER IS BASIC. A PH VALUE OF LESS THAN 6.5 OR GREATER THAN 8.5 IS CONSIDERED BY THE HEALTH DEPARTMENT TO BE A SECONDARY CONTAMINANT.

SPEC COND (SPECIFIC CONDUCTANCE): THE ABILITY OF WATER TO CONDUCT AN ELECTRIC CURRENT AS A RESULT OF DISSOLVED MINERAL MATTER, USED AS AN APPROXIMATE INDICATOR OF THE AMOUNT OF DISSOLVED MINERALS IN WATER. UNIT OF MEASURE IS MICROMHOS PER CENTIMETER.

T-DIS SOLID (TOTAL DISSOLVED SOLIDS): A MEASURE OF THE TOTAL AMOUNT OF DISSOLVED MINERAL MATTER IN WATER. UNIT OF MEASURE IS MILLIGRAMS PER LITER.

HARDNESS-TOTAL: A PARAMETER WHICH INDICATES THE EFFECTS OF CALCIUM, MAGNESIUM, AND OTHER METALS ON THE ABILITY OF WATER TO MAKE SOAP LATHER. UNIT OF MEASURE IS MILLIGRAMS PER LITER EXPRESSED AS CALCIUM CARBONATE.

HARDNESS-CALCIUM, MAGNESIUM: HARDNESS CONTRIBUTED BY CALCIUM AND MAGNESIUM, THE PRINCIPAL METALS WHICH CAUSE HARDNESS IN WATER. NOTE-BECAUSE TOTAL HARDNESS IS DETERMINED BY CHEMICAL TITRATION, WHEREAS CALCIUM-MAGNESIUM HARDNESS IS A MATHEMATICAL CALCULATION, CALCIUM-MAGNESIUM HARDNESS VALUES MAY BE HIGHER THAN TOTAL HARDNESS VALUES.

FE (IRON): UNIT OF MEASURE IS MILLIGRAMS PER LITER. IN CONCENTRATIONS GREATER THAN 0.3 MG/L, IRON IS CONSIDERED TO BE A SECONDARY CONTAMINANT BY THE HEALTH DEPARTMENT.

MN (MANGANESE): UNIT OF MEASURE IS MILLIGRAMS PER LTER. IN CONCENTRATIONS GREATER THAN 0.05 MG/L, MANGANESE IS CONSIDERED TO BE A SECONDARY CONTAMINANT BY THE HEALTH DEPARTMENT.

CA (CALCIUM): UNIT OF MEASURE IS MILLIGRAMS PER LITER.

MG (MAGNESIUM): UNIT OF MEASURE IS MILLIGRAMS PER LITER.

NA (SODIUM): UNIT OF MEASURE IS MILLIGRAMS PER LITER.

K (POTASSIUM): UNIT OF MEASURE IS MILLIGRAMS PER LITER.

ALK (ALKALINITY): UNIT OF MEASURE IS MILLIGRAMS PER LITER.

SO4 (SULFATE): UNIT OF MEASURE IS MILLIGRAMS PER LITER. IN CONCENTRATIONS GREATER THAN 250 MG/L, SULFATE IS CONSIDERED TO BE A SECONDARY CONTAMINANT BY THE HEALTH DEPARTMENT.

CL (CHLORIDE): UNIT OF MEASURE IS MILLIGRAMS PER LITER. IN CONCENTRATIONS GREATER THAN 250 MG/L, CHLORIDE IS CONSIDERED TO BE A SECONDARY CONTAMINANT BY THE HEALTH DEPARTMENT.

N3/N (NITRATE AS NITROGEN): UNIT OF MEASURE IS MILLIGRAMS PER LITER. IN CONCENTRATIONS GREATER THAN 10 MG/L NITRATE NITROGEN IS CONSIDERED TO BE A PRIMARY CONTAMINANT BY THE HEALTH DEPARTMENT.

VIRGINIA STATE WATER CONTROL BOARD
BUREAU OF SURVEILLANCE AND FIELD STUDIES

SUMMARY OF GROUND WATER QUALITY ANALYSES, COUNTY OF ALBEMARLE

****

SWCB NO	OWNER AND/OR PLACE	DATE SAMP	PH	SPEC COND	T-DIS SOILD	HARDNESS TOTAL	CA,MG	FE	MN	CA	MG	NA	K	ALK	SO4	CL	N3/N
2	KEARSARGE SUBDIVISION	2/77	7.6	160	136	72	74	0.01	0.00	26.1	2.2	15.9	4.9	91	4.0	2.0	0.13
2	KEARSARGE SUBDIVISION	11/71	8.0		148	73	72	0.01	0.02	26.5	1.5	10.0	4.0	86	5.0	4.5	0.20
2	KEARSAGE	7/61	7.4					0.20	0.13							1.3	0.00
4	JEFFERSON VILLAGE SUB	10/68	8.1			53		0.48	0.17	12.8		4.9	2.1	62	6.0	1.0	0.20
6	BERKLEY COMMUNITY	7/65	6.5				39	1.69	0.28	13.7	1.1				5.5	1.0	0.00
7	GREENFIELD SUB	2/66	7.4				20	4.50	0.25	6.2	1.1				2.3	1.5	
9	KEY WEST SUBDIV #2	12/69	7.6			399		0.16	0.01								
9	KEYWEST SUBDIVISION	6/64	7.7					0.10	0.13					126			
9	KEYWEST SUBDIVISION	12/62	8.0				186	0.13	0.11	68.3	3.7	9.5			73.3	3.1	1.10
9	KEYWEST SUBDIVISION	7/61	8.1												123.3		
9	KEYWEST SUBDIVISION	4/60	7.7					0.52	0.11						580.8	3.5	
10	MILLER SCHOOL-SP #1	3/77	6.3	27	49	22	7	0.00	0.00	3.0	0.0	3.0	0.0	9	2.6	1.0	0.50
10	MILLER SCHOOL-SP #1	1/74	7.2	39	39	17	11	0.05	0.00	3.2	0.8	2.3	1.6	8	2.7	2.0	0.80
10	MILLER SCHOOL (SP)	4/60	6.6					0.10	0.00							2.0	2.10
11	SPRINGFIELD SUBDIV #1	11/74	7.3			22	20	0.01	0.02	6.4	1.1	3.9	1.1	79	0.7	5.5	4.60
11	SPRINGFIELD SUB	8/64	7.0				22	0.10	0.05	4.8	2.5	3.4			0.7	1.7	0.30
12	KNOLLWOOD SUB	9/59	6.7					0.28	0.19							3.1	0.10
22	TOWN OF CROZET #4	/63	7.5					0.02	0.00							2.9	0.20
24	GLENARCHY SUBDIVISION	7/60	7.5					0.26	0.00							2.2	0.10
28	OBS WELL #28,KEY WEST	2/72	7.8	280	178		42	0.10		2.7	8.5	2.5	1.7		1.9	1.0	0.10
32	KESWICK CNTRY CLUB #2	7/70	7.8		120	129	128	0.08	0.04	36.0	9.4	6.2		130	6.2	4.0	0.00
35	ODYSSEY	6/77	6.9	92		42								45	3.6	0.0	0.60
35	ODYSSEY	3/77	6.7	86	111	70	38	0.10	0.01	8.5	4.0	5.6	0.8	119	3.2	2.0	1.20
36	WOODBROOK SUBDIVISON	12/60	7.1					2.20	0.54								
40	BERKLEY SUBDIVISION	10/64	7.7				54	2.11	0.35	16.3	3.2				11.4		
41	COLTHURST FARMS	3/74	7.1			8	15	0.01	0.00	5.2	0.6	3.7	2.6	22		3.0	0.70
41	COLTHURST FARMS	12/73	7.2	44	58	18	14	0.01	0.00	4.7	0.6	3.8	1.4	21	0.0	1.0	1.00
41	COLTHURST FARMS	6/64	7.5				56	0.07	0.00	13.9	5.2				0.7	0.5	0.60
55	BEDFORD HILLS SUB #1	9/70	3.7			62		0.19	0.02						9.3	68.5	

NOTE: ALL ZEROS INDICATE PARAMETER ANALYZED BUT NOT DETECTED

VIRGINIA STATE WATER CONTROL BOARD
BUREAU OF SURVEILLANCE AND FIELD STUDIES

SUMMARY OF GROUND WATER QUALITY ANALYSES, COUNTY OF ALBEMARLE

SWCB NO	OWNER AND/OR PLACE	DATE SAMP	PH	SPEC COND	T-DIS SOILD	HARDNESS TOTAL	CA,MG	FE	MN	CA	MG	NA	K	ALK	SO4	CL	N3/N
57	FLORDON SUBDIV #1	8/72	8.0		163	88	88	0.02	0.18	32.8	1.4	7.6	3.8	78	7.6	5.0	5.00
57	FLORDON SUBDIV #1	10/71	7.3		118	72	72	0.88	0.06	24.0	2.9	5.7	4.8	77	5.0	5.5	0.00
57	FLORDON SUBDIV #1	11/59	6.8			100	100	0.20		32.4	4.7	12.2		108	12.1	6.0	
58	FLORDON SUBDIV #2	12/73	7.9	140	127	66	64	1.55	0.08	20.0	3.5	8.5	4.9	77	6.9	1.2	0.00
58	FLORDON SUBDIV #2	10/71	7.5		125	81	81	0.09	0.06	28.1	2.7	8.0	4.3	89	6.3	4.0	0.00
59	WEST LEIGH SUBDIV #1	12/73	8.1	120	102	55	58	0.07	0.02	19.5	2.3	4.8	4.7	66	4.8	1.0	0.80
59	WEST LEIGH SUBDIV #1	10/71	7.5		100	55	55	0.01	0.03	20.8	0.7	4.8	5.0	62	2.8	5.5	0.00
59	WEST LEIGH SUB 1	4/60	7.0					0.16	0.00							1.3	1.00
78	BURTON COURT APTS	10/77	6.1	87	158	22	22	0.00	0.05	6.3	1.5	8.3	2.2	6	2.0	2.9	3.30
80	CRENSHAW'S MOBILE #2	2/78	7.2	305	245	159	170	10.20	2.15	48.8	11.8	9.9	7.5	164	2.0	4.5	0.00
84	LANGFORD FARMS SUB #1	10/77	7.8	180	198	86	88	0.32	0.12	29.0	3.7	8.1	4.4	98	3.0	0.0	0.00
89	PARK ROAD TR PK #1	10/77	7.0	153	129	64	66	0.00	0.14	22.4	2.5	6.2	2.4	36	3.0	0.6	1.50
93	TRIANGLE TR PK #1	10/77					20	0.57	0.06	4.9	1.9	8.0	2.5				
99	BROADUS WOOD SCH #1	2/77	6.5	52	79	16	19	0.00	0.00	6.0	1.0	1.0	1.6	29	3.0	2.0	0.35
108	STONE-ROBINSON SCHOOL	7/77	6.6	235	158	154	123	11.00	0.54	36.0	8.0	10.0	0.0	123	3.1	3.0	0.00
137	MERIWETHER LEWIS SCH	2/77	6.3	57	91	16	22	0.00	0.00	7.0	1.0	3.0	2.4	18	2.6	3.0	1.80
144	RONALD L DAVIS	6/77	6.1	40	45	28	12	0.10	0.00	3.0	1.0	5.0	2.0	16	3.4	3.0	1.00
145	A E SHIFFLET	6/77	6.0	40	50	34	10	0.00	0.01	4.0	0.0	4.0	2.0	18	3.4	3.0	0.60
146	GREENWOOD MOTEL	5/77	6.3	50	0	12	10	0.00	0.00	4.0	0.0	4.0	2.0	16	3.5	1.0	1.20
147	MARY VANDERPLOEG	6/77	7.1	220	158	138	154	0.00	0.01	52.0	6.0	6.0	1.0	99	6.5	10.0	2.40
148	C & R GROCERY	6/77	6.6	80	58	50	32	0.00	0.01	13.0	0.0	3.0	2.0	44	3.4	3.0	0.00
158	ALBERENE STONE CORP	3/77	6.8	180	151	76	46	7.20	0.25	7.0	7.0	18.0	4.0	28	2.2	23.0	20
158	ALBERENE STONE CORP	6/74	4.8														15
158	ALBERENE STONE CORP	3/74	6.3			53	52	0.31	0.21	9.0	7.3	14.5	4.9	7		18.5	14.5
158	ALBERENE STONE CORP	1/74	6.2														13
158	ALBERENE STONE CORP	12/73	6.8	178	120	51	52	0.32	0.19	8.5	7.6	1.5	2.6	7	0.0	19.7	19
167	TUCKAHOE MOTEL	3/77	7.3	175	138	96	88	0.60	0.04	25.0	6.2	9.1	0.7	85	4.1	8.0	1.20

NOTE: ALL ZEROS INDICATE PARAMETER ANALYZED BUT NOT DETECTED

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SWCB NO	OWNER AND/OR PLACE	DATE SAMP	PH	SPEC COND	T-DIS SOILD	HARDNESS TOTAL	CA,MG	FE	MN	CA	MG	NA	K	ALK	SO4	CL	N3/N
168	TULL MANUFACTURING	3/77	6.8	35	59	24	7	0.40	0.00	3.0	0.0	4.0	2.0	16	2.1	1.0	0.32
179	VDH-YANCEY MILLS HDQS	10/78	6.5	41	47	18	5	0.00	0.00	2.0	0.0	4.0	1.0	22	1.0	4.0	0.23
179	VDH-YANCEY MILLS HDQS	7/78	6.5	38	57	8	5	0.00	0.00	2.0	0.0	4.0	1.0	22	2.0	1.0	0.30
179	VDH-YANCEY MILLS HDQS	3/78	6.0	43	51	10				2.0		3.0	1.0	16	3.0	3.0	0.28
179	VDH-YANCEY MILLS HDQS	12/77	6.1	49	47	6	7	0.10	0.00	3.0	0.0	4.0	1.0	21	3.0	1.0	0.29
179	VDH-YANCEY MILLS HDQS	9/77	6.3	45	52	32	9	0.10	0.02	2.0	1.0	4.0	1.0	25	3.0	2.0	0.22
179	VDH-YANCEY MILLS HDQS	2/77	6.6	43	73	4	12	0.10	0.01	4.0	0.6	1.0	1.3	24	0.0	0.0	0.28
182	JIM PRICE CHEVROLET	10/78	7.6	355	290	196	207	0.50	2.20	55.0	17.0	10.0	1.0	151	2.0	45.0	0.00
182	JIM PRICE CHEVROLET	7/78	7.2	420	294	188	203	0.40	1.24	55.0	16.0	10.0	1.0	157	3.0	3.0	0.55
182	JIM PRICE CHEVROLET	3/78	7.0	456	252	180	186	0.20	0.58	50.0	15.0	9.0	1.0	145	4.0	36.0	0.70
182	JIM PRICE CHEVROLET	12/77	6.8	421	263	176	225	0.40	1.15	59.0	19.0	10.0	1.0	143	3.0	45.0	0.06
182	JIM PRICE CHEVROLET	9/77	6.7	230	285	202	193	0.30	0.94	51.0	16.0	10.0	1.0	134	5.0	44.0	0.00
182	JIM PRICE CHEVROLET	3/77	7.4	290	215	164	162	0.33	0.52	46.0	11.5	10.9	1.1	427	3.9	28.0	0.00
183	IVY FOOD MARKET	10/78	7.4	177	137	78	89	1.50	0.19	29.0	4.0	9.0	6.0	87	9.0	11.0	0.00
183	IVY FOOD MARKET	7/78	7.2	222	152	78	89	1.50	0.19	29.0	4.0	9.0	6.0	88	9.0	9.0	0.00
183	IVY FOOD MARKET	3/78	7.4	224	142	78	84	1.30	0.19	27.0	4.0	9.0	6.0	87	6.0	10.0	0.00
183	IVY FOOD MARKET	12/77	6.5	218	133	76	98	1.70	0.22	31.0	5.0	10.0	6.0	84	17.0	9.0	0.00
183	IVY FOOD MARKET	9/77	7.0	195	154	108	89	1.90	0.21	29.0	4.0	10.0	6.0	87	4.0	8.0	0.00
183	IVY FOOD MARKET	2/77	7.2	185	159	82	81	1.49	0.22	25.6	4.2	11.3	6.5	87	6.5	10.0	0.00
184	VDH-KEENE HDQRS	3/77	6.9	245	182	94	60	7.00	0.15	15.4	5.3	41.0	0.5	90	38.7	6.0	0.00
187	DETTOR,EDWARDS,MORRIS	8/74	6.5	55	71		19	1.60		6.0	1.0	5.3	2.7	26		0.0	0.90
189	VDH-BOYD TAVERN #2	2/77	6.4	58	72	18	26	1.00	0.11	6.0	2.6	0.0	0.0	31	2.7	3.0	0.05
192	MERIWETHER HILLS #1	12/73	7.6	96	61	41	37	0.65	0.05	9.0	3.5	4.5	5.9	50	2.8	2.7	0.00
192	MERIWETHER HILLS #1	3/72	7.7		91	43	43	0.05	0.20	14.4	1.7	4.5	6.0	55	5.1	1.0	0.20
194	CHRIS GREENE LAKE	5/77	7.4	190	135	88	97	0.00	0.26	34.0	3.0	9.0	5.0	97	4.0	0.0	0.00
201	AIRPORT MOTEL	3/77	6.4	29	51	28	7	0.00	0.01	1.8	0.5	4.4	1.7	10	2.4	2.0	1.20
202	BLUE RIDGE VENEER	3/77	6.6	142	143	74	55	0.10	0.00	12.0	6.0	6.0	1.0	57	3.6	9.0	1.60
203	FAIRVIEW CLUB	6/65	7.2				32	0.03	0.00	9.3	2.1	0.0			1.2	0.8	1.20
205	GLENAIRE SUBDIV #2	12/73	7.4	59	58	19	18	0.01	0.00	5.4	1.0	4.7	1.6	17	2.1	3.0	1.90
206	KNOLLWOOD SUBDIV #3	3/66	6.5			19	18	0.81	0.05	7.2	0.1			27			
206	KNOLLWOOD SUBDIV #3	4/64	6.6		34			0.57	0.00					15	1.2	1.3	0.10

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207	LAUREL HILLS SUBDIV	7/61	6.8			15		0.00	0.00					19		5.1	0.60
211	MORTON FROZEN FOOD #4	7/63	7.6		218		122	0.12	0.10	43.1	3.5	13.5		98	12.8	25.0	0.10
212	NORTHFIELD SUBDIV #1	3/60	8.0			110		0.22	0.05					131		1.3	0.00
213	NORTHFIELD SUBDIV #2	7/61	7.4			88		0.62	0.13					90		2.2	0.00
214	DEERWOOD SUBDIV #2	/67	7.2		106	44	43	0.22	0.02	14.4	1.8	6.0	2.2	64	1.3	2.5	0.70
215	VDH-BATESVILLE HDQRS	3/77	6.6	86	87	24	19	0.50	0.03	6.0	1.0	7.0	2.0	26	2.4	24.0	0.50
218	RED HILL SCHOOL	6/77	7.0	140	108	64	57	10.00	0.35	21.0	1.0	7.0	5.0	75	2.7	3.0	0.00
222	FOREST LODGE #1	5/77	6.9	55		21	18	0.23	0.01	5.8	0.9	4.5	1.7	28	3.5	1.0	0.10
222	FOREST LODGE #1	10/73	7.2	67	103	36	34	0.07	0.00	12.0	0.9	4.7	2.4	43	1.2	1.5	0.10
223	FOREST LODGE #2	5/77	7.4	95		53	52	0.02	0.00	18.7	1.2	3.0	1.5	46	4.5	1.5	0.00
223	FOREST LODGE #2	10/73	7.5	73	101	42	41	0.07	0.02	14.6	1.1	2.9	1.3	43	3.0	1.5	0.00
225	FOREST LODGE #4	5/77	7.4	195		89	86	0.00	0.04	28.8	3.4	11.3	3.6	109	5.1	0.0	0.00
225	FOREST LODGE #4	10/73	8.3	157	172	94	95	0.14	0.07	34.2	2.4	7.7	2.6	103	6.0	1.5	0.00
232	WALTON MIDDLE SCHOOL	2/77	6.8	88	94	40	36	0.06	0.00	8.2	3.7	8.4	1.0	42	2.8	8.0	0.13
236	SCOTTSVILLE SCHOOL	3/77	7.2	77	99	50	38	0.50	0.00	12.0	2.0	4.0	0.0	40	0.0	3.0	1.20
237	SHERATON INN #5	3/77	6.9	134	126	70	63	0.05	0.00	12.7	7.6	8.4	7.1	44	3.4	7.0	2.30
239	VA DIV FORESTRY #2	2/77	6.5	85	105	16	23	5.90	0.04	5.0	2.5	5.0	3.1	22	0.0	3.0	6.60
244	PEACOCK HILL SUB #3	2/77	6.8	144	123	50	50	0.35	0.08	15.9	2.6	8.0	6.9	80	6.5	2.0	0.00
245	I J BREEDEN INC #1	10/73	7.2	67	103	36	34	0.07	0.01	12.0	0.9	4.7	2.4	43	1.2	1.5	0.10
246	GLENAIRE SUBDIV #2A	12/73	7.2	78	77	27	22	0.01	0.00	6.7	1.3	5.6	1.7	20	3.4	5.5	2.90
246	GLENAIRE SUBDIV #2A	10/71	6.9		66	18	20	0.01	0.01	7.2	0.5	4.1	1.4	18	0.4	4.0	1.60
248	DR MARTIN C NETSKY	8/73	7.7	270	177		129	0.01		32.0	12.0	7.4	1.1		5.4	4.8	0.70
249	GEORGE CASON - SP	8/73	6.8	55	58		23	0.02		5.0	2.6	3.0	0.5		4.0	1.1	0.00
251	PEACOCK HILL SUBDIV	8/74	7.1	70	62		33	0.30		11.0	1.3	4.8	2.7	38		0.0	0.30
252	PEACOCK HILL SUBDIV	8/74	6.6	71	67		29	0.40		9.0	1.5	5.8	3.8	24		0.0	0.00

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253	P M BABER	8/74	6.6	65	60		24	0.10		7.0	1.5	7.8	2.8	32		0.0	0.60
255	ACME VISIBLE RECORD #1	10/71	7.4		136	89	89	1.60	0.01	28.1	4.6	6.4	0.4	67	8.6	14.0	7.00
257	ACME VISIBLE RECORD #3	2/77	6.7	117	113	52	54	0.08	0.00	15.1	4.0	8.6	1.8	54	5.2	4.0	0.60
258	BEDFORD HILLS SUB #2	9/70	7.5			63		0.23			0.0			80	10.1	1.5	
261	CROUSE-HINDS #1	1/74	8.0	358	260	122	120	0.01	0.04	40.3	4.7	24.5	18.5	69	7.0	38.5	6.40
261	CROUSE-HINDS #1	1/72	7.9		132	89	89	0.01	0.02	31.2	2.6	5.5	4.3	99	4.0	1.0	0.00
262	CROUSE-HINDS #2	1/74	8.1	173	111		63	0.04	0.00	20.7	2.8	9.0	6.5	78	3.7	1.5	0.00
263	CROUSE-HINDS #3	1/74	8.2	209	137	91	88	0.00	0.00	32.0	2.1	5.0	7.5	99	4.0	0.5	0.00
264	TELEDYNE AVIONICS #1	5/77	6.2	80	51	29	27	0.00	0.02	9.0	1.0	6.0	4.0	23	3.9	4.0	1.70
264	TELEDYNE AVIONICS #1	10/71	7.1		62	23	23	0.01	0.01	8.8	0.2	4.3	2.9	24	4.2	3.0	1.20
265	TELEDYNE AVIONICS #2	1/72	6.9		32	12	12	7.30	0.21	1.6	1.9	4.3	2.6	18	0.1	6.0	0.00
267	VA DIV FORESTRY #1	2/77	6.6	93	113	38		0.11	0.00	13.4		8.1	2.2	42	3.1	4.0	1.80
268	LAKE REYNOVIA #1	3/77	7.0	112	106	66	52	0.44	0.17	18.3	1.6	5.0	0.7	32	25.0	0.0	0.00
274	NANCY BISHOP	4/77	7.4	145	151	62	71	0.00	0.00	25.0	2.0	7.0	4.0	70	4.6	2.0	0.00
285	LAIRD & CO	6/77	6.4	65	62	23	19	0.20	1.00	6.0	1.0	7.0	2.0	31	3.3	2.0	0.30
296	ROSE HILL BAPT CHURCH	9/77	6.3	46	32	44	20	0.60	0.07	3.0	3.0	2.0	0.0	23	4.0	5.0	0.00
303	SAFARI CAMPGROUND	5/77	6.6	130	83	53	58	1.30	0.05	20.0	2.0	7.0	5.0	60	4.4	4.0	0.00
306	S L WILLIAMSON CO INC	6/77	7.4	295	223	153	178	0.00	0.56	63.0	5.0	9.0	7.0	139	18.5	2.0	0.00
323	CRICKENBERGER	6/77	7.5	240	166	158	84	0.00	0.00	32.0	1.0	5.0	0.0	36	4.3	3.0	0.40
327	BETTY POWELL	4/77	6.2	118	101	46	42	0.00	0.00	12.0	3.0	7.0	4.0	28	2.7	19.0	1.60
332	C M THACH	4/77	6.2	48	74	36	15	0.00	0.00	6.0	0.0	6.0	3.0	25	5.7	2.0	0.35
333	DR JOHN YOUEL	6/77	7.5	190	123	92	86	0.00	0.00	33.0	1.0	8.0	5.0	97	2.5	2.0	0.00
343	DOUG MILLER	7/77	7.2	195	139	92	83	0.00	0.01	25.0	5.0	11.0	0.0	101	5.4	1.0	0.18
367	BRUCE BROWN	5/77	6.2	60	40	24								27	3.5	0.0	0.21

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368	H M WITTKOP	4/75	6.1	110	94		66	0.10	0.10	18.0	5.1	7.8	0.2	34	3.0	8.0	3.20
387	L L LIVELY JR	5/77	6.5	130	117	64	55	0.00	0.08	17.0	3.0	8.0	0.0	69	4.0	2.0	0.00
404	MARY S THOMAS #2	10/77	6.3	49	49	15	17	0.00	0.00	5.0	1.0	4.0	1.0	21	3.0	2.0	0.09
413	JAMES SADOWSKI	8/77	5.8	50	56	14	16	0.00	0.00	3.0	2.0	6.0	1.0	19	7.0	2.0	0.70
417	PETE THACKER	6/77	6.4	97	83	38	36	0.60	0.00	8.0	4.0	4.0	1.0	51	2.1	2.0	0.08
423	DR DOUGLAS V NICOLL	4/77	6.2	115	117	50	56	0.40	0.04	19.0	2.0	9.0	5.0	36	3.2	9.0	2.70
429	JERRY TOMLIN	4/77	6.9	195	177	100	92	3.40	0.39	32.0	3.0	8.0	3.0	107	4.5	1.0	0.00
432	JAMES M WEBBER	5/77	7.1	140	103	65								73	4.5	0.0	0.00
433	FLOYD HURT	7/77	6.3	95	79	68	37	2.50	0.03	10.0	3.0	4.0	3.0	48	3.1	4.0	0.00
434	TOTIER CREEK PARK	3/77	7.2	146	141	48	43	0.10	0.00	14.0	2.0	23.0	1.0	43	24.0	6.0	1.40
439	GREENWOOD CHEMICAL #1	3/76	6.9	177	175		105	0.00	0.00	23.0	11.5	18.0	0.6	83		13.0	2.50
441	H T PIPPIN	6/76	7.5	230	179	114								131	2.7	3.0	0.40
442	C'VILLE AIRPORT	10/71	7.0		61	31	31	0.01	0.01	12.0	0.2	4.4	2.9	37	0.4	2.0	2.00
445	ASH LAWN	9/77	7.4	230	172	126	126	0.00	0.13	34.0	10.0	11.0	0.0	135	5.0	5.0	0.00
459	DR RICHARD EDLICH	5/77	6.4	70	48	29	28	1.30	0.07	8.0	2.0	5.0	2.0	34	3.7	1.0	0.08
514	BURTON	6/77	7.6	280	195	26	161	0.30	0.21	53.0	7.0	8.0	5.0	156	2.8	2.0	0.00
515	HUGH MOTLEY	7/77	6.2	65	57	38	27	0.50	0.00	6.0	3.0	5.0	0.0	33	2.6	1.0	0.00
524	W H WHITE III	8/77	6.2	60	56	26	26	0.50	0.03	7.0	2.0	5.0	1.0	28	6.0	2.0	1.10
528	S C WEBB	11/77	6.7	80	78	26	31	0.00	0.02	9.0	2.0	5.0	3.0	30	3.0	4.0	0.17
539	RICK MILLER	9/77	7.2	110	90	122	56	0.50	0.02	16.0	4.0	6.0	0.0	61	3.0	2.0	0.45
543	EDWARD HENDERSON	8/77	6.1	36	53	30	15	0.80	0.01	6.0	0.0	4.0	2.0	19	5.0	2.0	0.30
561	DR ERNEST O ATTINGER	8/77	6.9	98	90	60	43	0.00	0.00	9.0	5.0	7.0	0.0	55	5.0	2.0	0.35
588	VDH-SHADWELL HDQTRS	5/77	6.2	70	95	76	30	0.00	0.00	7.0	3.0	5.0	1.0	34	2.2	2.0	1.10

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589	VDH-FREE UNION HDQTRS	4/77	6.1	89	103	24	24	0.00	0.00	8.0	1.0	8.0	3.0	15	2.6	19.0	0.45
590	STONY POINT SCHOOL	5/77	6.3	110	102	86	53	0.00	0.01	13.0	5.0	6.0	1.0	48	2.5	4.0	1.60
591	J P SADLER	7/77	6.4	62	57	46	28	0.00	0.00	8.0	2.0	4.0	1.0	35	3.0	5.0	0.08
592	CHARLES WINGFIELD	6/77	6.5	70	59	14	12	0.10	0.00	3.0	1.0	4.0	3.0	67	3.4	2.0	0.53
593	DALE F ROLLINS	7/77	6.0	43	53	58	22	0.00	0.00	9.0	0.0	5.0	1.0	24	3.0	3.0	0.00
594	MONTY ROGERS	6/77	7.2	180	113	73	81	0.00	0.00	29.0	2.0	9.0	6.0	74	2.0	12.0	1.20
595	AUBREY ROACH	6/77	6.3	80	61	27	23	3.00	0.04	6.0	2.0	6.0	2.0	29	3.5	6.0	1.50
596	HAROLD L GIBSON	8/77	5.8	70	62	22	14	0.20	0.00	4.0	1.0	6.0	2.0	26	7.0	6.0	1.70
597	DR ROBERT M MACLEOD	8/77	5.9	60	55	32	18	0.20	0.01	4.0	2.0	5.0	2.0	22	7.0	3.0	0.60
598	SUGAR HOLLOW DAM	8/77	6.5	290	195	164	172	6.50	0.81	59.0	6.0	9.0	0.0	166	6.0	2.0	0.00
599	MONTFAIR CAMPGROUND	8/77	6.5	180	141	84	114	0.40	0.04	39.0	4.0	9.0	2.0	96	11.0	2.0	0.00
600	BRUCE PATTERSON	6/77	6.0	30	47	12	5	0.00	0.00	2.0	0.0	5.0	1.0	16	5.0	1.0	0.39
601	W W MORRIS	7/77	6.4	44	51	18	12	0.00	0.00	5.0	0.0	4.0	1.0	18	3.0	3.0	1.70
602	DAVID E MARSHALL	7/77	5.9	28	38	48	7	0.10	0.00	3.0	0.0	4.0	1.0	12	3.0	1.0	0.70
603	LUCK QUARRIES #1	5/77	6.8	330	234	132	123	0.10	0.01	28.0	13.0	32.0	3.0	82	25.0	44.0	1.00
604	GREENWOOD ELEM SCHOOL	6/77	6.8	140	112	63	65	0.10	0.00	21.0	3.0	7.0	1.0	59	3.8	2.0	0.07
605	H E GIBSON	6/77	7.0	120	85	49	49	0.70	0.03	13.0	4.0	6.0	6.0	61	5.0	2.0	0.00
606	DR C H FOX	7/77	5.9	63	57	54	19	0.00	0.00	6.0	1.0	6.0	2.0	20	3.0	7.0	0.08
607	LUCILLE ENGLISH	7/77	7.2	119	131	110	60	0.00	0.00	24.0	0.0	4.0	1.0	69	3.0	1.0	0.50
608	HARRY DAWSON	7/77	6.2	36	43	50	7	0.00	0.02	3.0	0.0	4.0	1.0	20	3.0	2.0	0.10
609	HAROLD DAVIS	7/77	6.2	29	42	18	5	0.00	0.00	2.0	0.0	4.0	1.0	11	3.0	3.0	0.80
610	JAMES J BROWN JR	6/77	6.2	50	46	22	5	0.00	0.00	2.0	0.0	4.0	2.0	23	3.4	3.0	0.60
611	BEAVER CREEK RESERVR	6/77	6.5	80	60	29	22	0.20	0.08	9.0	0.0	5.0	5.0	36	8.5	2.0	0.00

NOTE: ALL ZEROS INDICATE PARAMETER ANALYZED BUT NOT DETECTED

VIRGINIA STATE WATER CONTROL BOARD
BUREAU OF SURVEILLANCE AND FIELD STUDIES

SUMMARY OF GROUND WATER QUALITY ANALYSES, COUNTY OF ALBEMARLE

SWCB NO	OWNER AND/OR PLACE	DATE SAMP	PH	SPEC COND	T-DIS SOILD	HARDNESS TOTAL	CA,MG	FE	MN	CA	MG	NA	K	ALK	SO4	CL	N3/N
612	ROBERT L RICE	9/77	7.4	170	145	82	94	0.00	0.00	23.0	9.0	7.0	0.0	101	3.0	1.0	0.00
613	M H MERCHANT	9/77	5.1	240	236	98	161	0.10	0.02	38.0	16.0	10.0	0.0	4	3.0	24.0	6.50
614	RICHARD HEETER	9/77	6.8	40	49	4	14	0.40	0.05	4.0	1.0	5.0	0.0	81	3.0	1.0	0.00
615	GEORGE L HOWE	9/77	7.3	230	164	108	168	0.10	0.08	36.0	19.0	12.0	0.0	15	5.0	2.0	0.00
616	WILLIAM RATUSNOCK	8/77	5.5	25	42	22	7	0.00	0.00	3.0	0.0	3.0	2.0	9	17.0	0.0	1.40
617	WALLACE KENNEDY	8/77	6.0	138	62	42	27	0.00	0.00	9.0	1.0	5.0	2.0	33	5.0	0.0	0.70
618	THOMAS C JOSEPH	8/77	6.3	72	66	64	31	4.10	0.09	9.0	2.0	6.0	2.0	34	5.0	5.0	0.35
619	R M WILBUR	8/77	7.0	82	114	76	44	0.00	0.00	11.0	4.0	5.0	0.0	72	5.0	3.0	1.00
620	E B MCCORMICK	9/77	7.9	210	156	112	124	0.10	0.00	30.0	12.0	7.0	0.0	134	5.0	3.0	2.10
621	JOHN H HAGA	9/77	6.2	70	64	14	22	0.20	1.50	4.0	3.0	7.0	3.0	23	3.0	3.0	3.40
622	BENNIE L LEAP	9/77	7.2	80	65	40	48	0.00	0.01	16.0	2.0	2.0	2.0	46	3.0	1.0	0.00
623	M W JONES	9/77	6.2	110	288	118	100	0.00	0.01	32.0	5.0	28.0	4.0	28	7.0	54.0	11.5
624	ALEASE HARRIS	9/77	8.0	140	13	2	2	0.10	0.04	1.0	0.0	1.0	0.0	105	3.0	1.0	0.20
625	CLEDIUS FIELDS	11/77	6.4	34	22	22	13	0.30	0.02	2.0	2.0	2.0	0.0	17	2.0	5.0	0.00
626	LARKIN LONDERLE	11/77	7.0	53	61	20	23	0.00	0.00	6.0	2.0	4.0	0.0	23	2.0	3.0	1.10
627	MEREDITH CLARK	11/77	6.9	100	86	60	47	0.10	0.02	9.0	6.0	4.0	0.0	41	2.0	9.0	0.80
654	PAUL CLARK	12/77	5.7	27	37	6	5	0.00	0.00	2.0	0.0	4.0	0.0	12	3.0	1.0	0.25
669	UNKNOWN	12/77	5.3	25	24	20	7	0.20	0.00	1.0	1.0	2.0	0.0	9	3.0	6.0	0.13
670	O S BECK	12/77	6.0	49	58	18	10	0.00	0.00	4.0	0.0	5.0	1.0	25	3.0	4.0	0.29
671	C E ROBERTS	12/77	6.3	99	75	60	37	0.70	0.01	13.0	1.0	5.0	3.0	48	4.0	1.0	0.00
672	G E HANEY	12/77	5.9	38	39	34	7	0.00	0.00	3.0	0.0	4.0	1.0	19	3.0	4.0	0.00
673	CATHERINE B NORVELL	12/77	5.8	25	36	12	5	0.00	0.00	2.0	0.0	3.0	1.0	10	3.0	4.0	0.29
674	MORTON FROZEN FOOD #5	10/64	8.0		135	18		0.00	0.03	10.9				72	4.9		

NOTE: ALL ZEROS INDICATE PARAMETER ANALYZED BUT NOT DETECTED

VIRGINIA STATE WATER CONTROL BOARD
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SUMMARY OF GROUND WATER QUALITY ANALYSES, COUNTY OF ALBEMARLE

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SWCB NO	OWNER AND/OR PLACE	DATE SAMP	PH	SPEC COND	T-DIS SOILD	HARDNESS TOTAL	CA,MG	FE	MN	CA	MG	NA	K	ALK	SO4	CL	N3/N
687	HOWARD WOOD	11/77	6.5	72	50	22	32	0.00	0.01	11.0	1.0	4.0	2.0	36	4.0	4.0	0.19
688	HOLMES BROWN	11/77	6.4	170	152	48	52	0.00	0.02	16.0	3.0	11.0	5.0	23	3.0	23.0	8.00
689	FRANK ELLIOTT	11/77	6.2	50	61	15	7	13.00	0.13	3.0	0.0	6.0	1.0	17	3.0	11.0	0.45
690	CROSSROADS STORE	10/77	6.2	73	77	16	28	0.60	0.00	8.0	2.0	5.0	2.0	19	3.0	10.0	0.90
691	R H DAWSON	11/77	6.3	37	37	6	7	1.10	0.00	3.0	0.0	4.0	2.0	12	3.0	5.0	0.60
692	JOSIE B MARTIN	11/77	7.1	65	62	20	27	0.00	0.00	9.0	1.0	5.0	2.0	31	4.0	3.0	0.00
693	JAMES MORRIS	11/77	6.4	28	30	6	5	0.00	0.01	2.0	0.0	4.0	2.0	12	3.0	5.0	0.12
694	W W STEPHENSON	11/77	5.9	27	28	4	5	0.00	0.00	2.0	0.0	3.0	1.0	9	6.0	4.0	0.13
695	CECIL SMITH	11/77	6.9	84	78	46	48	0.00	0.00	11.0	5.0	4.0	0.0	49	4.0	5.0	0.29
696	JIMMY HIGGINS	11/77	7.4	230	180	128	138	0.20	0.11	34.0	13.0	7.0	1.0	138	3.0	8.0	0.07
697	C P MADISON	11/77	6.2	51	51	22	25	0.00	0.02	5.0	3.0	3.0	1.0	27	4.0	1.0	0.47
698	FINLEY L RAGLAND	11/77	7.0	128	107	59	66	0.40	0.09	20.0	4.0	7.0	5.0	71	9.0	2.0	0.00
699	M G HENDERSON	11/77	6.4	50	70	16	24	0.00	0.01	8.0	1.0	5.0	1.0	29	4.0	5.0	0.17
700	EUGENE TUTTLE	11/77	6.6	91	89	44	48	0.30	0.00	11.0	5.0	5.0	0.0	48	4.0	7.0	0.22
701	JAMES MAYNOR	11/77	7.6	275	200	128	135	0.10	0.35	36.0	11.0	24.0	0.0	111	54.0	4.0	0.00
702	EDNA LOVING	11/77	6.3	23	20	8	5	0.00	0.00	2.0	0.0	2.0	0.0	12	2.0	4.0	0.00
703	SAMUEL R THACKER	11/77	6.2	36	35	38	13	0.00	0.00	2.0	2.0	3.0	0.0	16	2.0	3.0	0.22
716	WILLIAM RUSH	12/77	6.4	145	92	42	59	0.10	0.00	22.0	1.0	6.0	3.0	49	9.0	17.0	0.80
717	HANTLEY BRUSCOE	11/77	6.6	53	54	24	27	0.50	0.00	6.0	3.0	2.0	0.0	26	2.0	2.0	0.53
730	VDH-FREE UNION HDQTRS	4/77	6.1	89	103	24	24	0.00	0.00	8.0	1.0	8.0	3.0	15	2.6	19.0	0.45
767	DAVE LANDIN	9/77	7.6	32	235	186	192	0.20	0.09	54.0	14.0	6.0	0.0	158	31.0	4.0	0.00

APPENDIX D

TABLE 4

MAJOR CHEMICAL CONSTITUENTS IN GROUND WATER

Constituent	Maximum Recommended Concentration (mg/1)*	Remarks
Calcium	200	Seldom a health concern; may be a disadvantage in washing, laundry, bathing; encrustations on utensils
Chloride	**250 (Aesthetics)	Taste is a major criterion; generally not harmful unless in very high concentrations, but may be injurious to sufferers of heart and kidney diseases; sea water is 19,000 mg/1
Fluoride	**1.8 (Health)	Presence of about 1.0 mg/1 may be more beneficial than detrimental; concentrations less than 0.9 to 1.0 mg/1 will seldom cause mottled enamel in children's teeth; extreme doses (2.5 to 4 grams) may cause death
Hardness (as $CaCO_3$)	0-60 Soft 61-120 Mod. Hard 121-180 Hard 181+ Very Hard	Hard waters have had no demonstrable harmful effects upon the health of consumers; major detrimental effect is economic--values above 100 mg/1 become increasingly inconvenient; wastes soap and causes utensil encrustation
Iron	**0.3 (Aesthetics)	Essential to nutrition and not detrimental to health unless in concentrations of several milligrams; main problems are bad taste, staining and discoloration of laundry and porcelain fixtures
Magnesium	150	Not a health hazard because taste becomes extremely unpleasant before toxic concentrations reached; may have laxative effect on new users
Manganese	**0.05 (Aesthetics)	Essential to nutrition but may be toxic in high concentrations; taste becomes problem before toxic concentrations reached; undesirable because it causes bad taste, deposits on cooked food, stains and discolors laundry and plumbing fixtures
Nitrate	**10 as N (Health)	May be extremely poisonous in high concentrations; may cause disease in infants ("blue baby"); irritates bladder and gastrointestinal tract, may cause diarrhea
pH	**6.5-8.5 (Aesthetics)	Indicates whether solution will act as an acid or base; water acquires "sour" taste below 4; high values favor corrosion control; efficiency of chlorination severely reduced when pH above 7
Potassium	1000-2000	May act as a laxative in excessive quantities
Sodium	100	May be harmful to sufferers of cardiac, circulatory, or kidney disease; concentrations as low as 200 mg/1 may be injurious
Solids (Total Dissolved)	**500 (Aesthetics)	Not a health hazard above 500 mg/1, but may impart disagreeable taste, corrode pipes; general indicator of the amount of minerals in water
Specific Conductivity	1000	An indicator of the amount of dissolved solids in water; high concentrations can cause corrosion of iron and steel
Sulfate	**250 (aesthetics)	Above 250 mg/1 may act as laxative on new users; may impart foul taste and odor

*Recommended concentrations based on current literature; pH measured in units, Conductivity in micromhos

**Actual limits established by the Virginia Department of Health; parentheses () indicate basis for limit

Source: Modified after McKee and Wolf (1963), Hem (1970), Virginia Department of Health (1977)

APPENDIX E

Ground Water Quality Standards and Criteria

Amendment to Water Quality Standards
Virginia State Water Control Board

Effective: August 1, 1977

Pursuant to Section 62.1-44.15(3) of the State Water Control Law (Chapter 3.1 of Title 62.1, Code of Virginia, 1950, as amended)

5.00 Ground Water Criteria and Standards

Ground water quality standards will apply statewide, and will apply to all ground water occurring at and below the uppermost seasonal limits of the water table. In order to prevent the entry of pollutants into ground water occurring in any aquifer, a soil zone or alternate protective measure or device sufficient to preserve and protect present and anticipated uses of ground water shall be maintained at all times. Zones for mixing wastes with ground water may be allowed upon request, shall be determined on a case-by-case basis, and shall be kept as small as possible.

It is recognized that natural ground water quality varies statewide. Four physiographic provinces have been determined for application of standards, namely the Coastal Plain, Piedmont and Blue Ridge, Valley and Ridge, and Cumberland Plateau. (See Plate 28)

If the concentration of any constituent in ground water is less than the limit set forth by ground water standards, the natural quality for that constituent shall be maintained; natural quality shall also be maintained for all constituents, including temperature, not set forth in any ground water standards. If the concentration of any constituent in ground water exceeds the standard for that constituent, no addition of that constituent to the naturally occurring concentration shall be made. Variance to this policy will not be made unless it has been affirmatively demonstrated that a change is justifiable to provide necessary economic or social development, that the necessary degree of waste treatment cannot be economically or socially justified, and that the present and anticipated uses of such water will be preserved and protected.

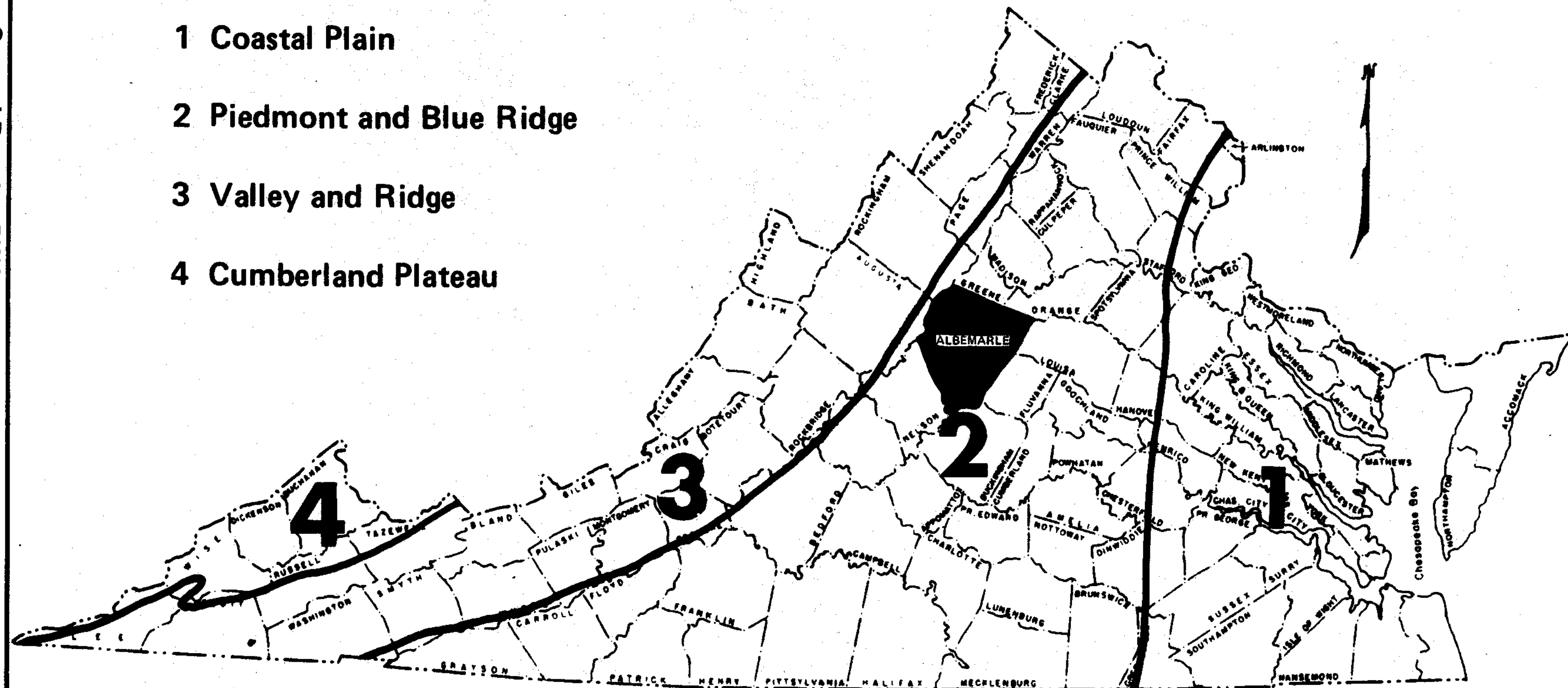
PHYSIOGRAPHIC PROVINCE BOUNDARIES FOR GROUND WATER QUALITY STANDARDS

1 Coastal Plain

2 Piedmont and Blue Ridge

3 Valley and Ridge

4 Cumberland Plateau



Source: Virginia State Water Control Board — BWCM

PLATE NO. 28

TABLE 5

GROUND WATER QUALITY CRITERIA
(See Plate 28)

Constituent	Concentration in the Coastal Plain	Piedmont & Blue Ridge	Valley & Ridge	Cumberland Plateau	
Alkalinity	30-500	10-200	30-500	30-200	mg/1
Chloride	50*	25	25	25	mg/1
Color	15	15	15	15	color units
Fluoride	1.4**	1.4	1.4	1.4	mg/1
Hardness	120	120	300	180	mg/1
Iron	0.3	0.3	0.3	0.01 - 10	mg/1
Manganese	0.05	0.05	0.05	0.01 - 0.5	mg/1
Sodium	100*	25	25	100	mg/1
Sulfate	50	25	100	150	mg/1
Total Dissolved Solids	1000	250	500	500	mg/1
Total Organic Carbon	10	10	10	10	mg/1

*It is recognized that naturally occurring concentrations will exceed this limit in the eastern part of the Coastal Plain, especially toward the shoreline and with increased depth.

**Except within the Cretaceous aquifer: concentration up to 5 mg/1 and higher

TABLE 6

GROUND WATER QUALITY STANDARDS
(See Plate 28)

Statewide Standards

Constituent	Concentration
Arsenic	0.05 mg/1
Barium	1.0 mg/1
Cadmium	0.4 ug/1
Chromium	0.05 mg/1
Copper	1.0 mg/1
Cyanide	5.0 ug/1
Foaming Agents as Methylene Blue Active Substances	0.05 mg/1
Lead	0.05 mg/1
Mercury	0.05 ug/1
Petroleum Hydrocarbons	1.0 mg/1
Phenols	0.001 mg/1
Selenium	0.01 mg/1
Silver	0.00
Zinc	0.05 mg/1
Chlorinated Hydrocarbon Insecticides	
Aldrin/Dieldrin	0.003 ug/1
Chlordane	0.01 ug/1
DDT	0.001 ug/1
Endrin	0.004 ug/1
Heptachlor	0.001 ug/1
Heptachlor Epoxide	0.001 ug/1
Kepone	0.00
Lindane	0.01 ug/1
Methoxychlor	0.03 ug/1
Mirex	0.00
Toxaphene	0.00
Chlorophenoxy Herbicides	
2,4-D	0.1 mg/1
2,4,5-TP	0.01 mg/1
Radioactivity	
Gross Beta	1000.0 pc/1
Radium 226	3.0 pc/1
Strontium 90	10.0 pc/1

	Concentration in the			
Constituent	Coastal Plain	Piedmont & Blue Ridge	Valley & Ridge	Cumberland Plateau
Ammonia Nitrogen	0.025	0.025	0.025	0.025 mg/1
Nitrate Nitrogen	5.0	5.0	5.0	0.5 mg/1
Nitrite Nitrogen	0.025	0.025	0.025	0.025 mg/1
pH	6.5-9.0	5.5-8.5	6.0-9.0	5.0-8.5

APPENDIX F

TABLE 7

PLANNING GUIDE FOR WATER USE

Types of Establishments	Gallons per day
Airports (per passenger)	3-5
Apartments, multiple family (per resident)	60
Bath houses (per bather)	10
Camps:	
Construction, semipermanent (per worker)	50
Day with no meals served (per camper)	15
Luxury (per camper)	100-150
Resorts, day and night, with limited plumbing (per camper)	50
Tourist with central bath and toilet facilities (per person)	35
Cottages with seasonal occupancy (per resident)	50
Courts, tourist with individual bath units (per person)	50
Clubs:	
Country (per resident member)	100
Country (per nonresident member present)	25
Dwellings:	
Boardinghouses (per boarder)	50
Additional kitchen requirements for nonresident boarders	10
Luxury (per person)	100-150
Multiple-family apartments (per resident)	40
Rooming houses (per resident)	60
Single family (per resident)	50-75
Estates (per resident)	100-150
Factories (gallons per person per shift)	15-35
Highway rest area (per person)	5
Hotels with private baths (2 persons per room)	60
Hotels without private baths (per person)	50
Institutions other than hospitals (per person)	75-125
Hospitals (per bed)	250-400
Laundries, self-serviced (gallons per washing, i.e., per customer)	50
Livestock (per animal):	
Cattle (drinking)	12
Dairy (drinking and servicing)	35
Goat (drinking)	2
Hog (drinking)	4
Horse (drinking)	12
Mule (drinking)	12
Sheep (drinking)	2
Steer (drinking)	12
Motels with bath, toilet, and kitchen facilities (per bed space)	50
With bed and toilet (per bed space)	40
Parks:	
Overnight with flush toilets (per camper)	25
Trailers with individual bath units, no sewer connection (per trailer)	25
Trailers with individual baths, connected to sewer (per person)	50

Picnic:	
With bathhouses, showers, and flush toilets (per picnicker)	20
With toilet facilities only (gallons per picnicker)	10
Poultry:	
Chickens (per 100)	5-10
Turkeys (per 100)	10-18
Restaurants with toilet facilities (per patron)	7-10
Without toilet facilities (per patron)	2½-3
With bars and cocktail lounge (additional quantity per person)	2
Schools:	
Boarding (per pupil)	75-100
Day with cafeteria, gymnasiums, and showers (per pupil)	25
Day with cafeteria but no gymnasiums or showers (per pupil)	20
Day without cafeteria, gymnasiums, or showers (per pupil)	15
Service stations (per vehicle)	10
Stores (per toilet room)	400
Swimming pools (per swimmer)	10
Theaters:	
Drive-in (per car space)	5
Movie (per auditorium seat)	5
Workers:	
Construction (per person per shift)	50
Day (school or offices per person per shift)	15

Source: U.S. Environmental Protection Agency (1974)

GLOSSARY OF TERMS

AQUIFER:	A geologic formation, group of formations or part of a formation capable of supplying water to wells and springs in usable quantities. An aquifer is unconfined (water table) or confined (artesian) depending on whether the ground water level is at atmospheric pressure or greater than atmospheric pressure due to the presence of an overlying, confining geologic formation (aquiclude).
BASALT:	A general term used to define any fine-grained, dark-colored igneous rock.
BEDROCK:	Any solid rock exposed at the surface or overlain by unconsolidated materials.
CATACLASTIC ROCK:	Metamorphic rock whose texture or structure is caused by the bending, breaking and granulation of the mineral within the rock.
CONGLOMERATE:	A clastic rock composed of rounded pebbles cemented together by another mineral.
CRYSTALLINE ROCK:	General term describing an igneous or metamorphic rock as opposed to a sedimentary rock.
DRAWDOWN:	The measured difference between static level and pumping level in a well; the drop in the water level due to pumping.
EVAPOTRANSPIRATION:	A term embracing that portion of the precipitation returned to the air through direct evaporation or by transpiration of vegetation, no attempt being made to distinguish between the two.
FAULT:	A fracture or fracture zone along which there has been movement of two rock masses relative to one another parallel to the fracture. The movement may be a few inches or many miles, horizontal or vertical.
FORMATION:	A unit of geologic mapping consisting of a recognizable stratum or set of strata useful for mapping or description.
FRACTURE:	Any break in a rock due to mechanical failure by stress.

FRACTURE TRACE:	The surface expression of a zone of structural weakness which may be identified by the alignment of valleys, vegetation types, sinkholes, or other surface depressions.
GNEISS:	A coarse-grained rock formed by regional metamorphism in which bands of granular minerals alternate with bands of flaky (schistose) minerals.
GROUND WATER:	Water below the water table; water in the zone of saturation.
HYDROGEOLOGY:	The science which deals with subsurface waters and related geological aspects of surface waters.
HYDROLOGY:	The science that relates to the waters of the earth.
IGNEOUS	Rocks or minerals that solidified from molten rock (magma).
IMPERMEABLE:	Having a texture which does not allow perceptible movement of water through rock.
INTRUSIVE:	Refers to igneous rocks which have penetrated into or between older rocks while molten but which have solidified before reaching the surface.
JOINT:	A fracture in rock along which no appreciable movement has occurred. Joints are generally perpendicular to bedding planes.
LIMESTONE:	A bedded sedimentary rock consisting chiefly of calcium carbonate ($CaCO_3$).
LITHOLOGY:	The composition and structure of rock.
METAMORPHIC:	Refers to any rocks derived from pre-existing rocks in response to pronounced changes of temperature, pressure and chemical environment.
METASEDIMENTARY:	Refers to sedimentary rocks which have been partly metamorphosed.
METAVOLCANIC:	Refers to volcanic rocks which have been partly metamorphosed.
PERCOLATION:	Movement of water through the interstices of rocks or soils, except movement through large openings such as solution channels.

PERMEABILITY:	The ability of a rock, sediment or soil to transmit water.
POROSITY:	The property of a rock, soil, or other material of containing spaces or voids.
PUMPING LEVEL:	Depth to water in a well when the well is being pumped.
QUARTZITE:	A metamorphic rock consisting principally of quartz.
RECHARGE:	The addition of water to an aquifer by natural infiltration or artificial means.
RIVER BASIN:	The area drained by a river and its tributaries.
RUNOFF:	That part of precipitation that flows in surface streams.
SANDSTONE:	A sedimentary rock composed chiefly of quartz grains.
SAPROLITE:	Earthy, clay-rich material formed in place by the decomposition of igneous and metamorphic rocks.
SEDIMENTARY ROCK:	Rock formed from the consolidation of layered sediments that have accumulated in water.
SHALE:	A fine-grained sedimentary rock formed from the consolidation of clay, silt or mud.
SLATE:	A fine-grained metamorphic rock, usually formed from shale or volcanic ash.
STATIC LEVEL:	Depth to water in a well when the well is not being pumped.
UNCONSOLIDATED SEDIMENT:	A sediment that is loosely arranged or unstratified, or whose particles are not cemented together.
WATER TABLE:	The upper surface of the zone of saturation; the upper surface of ground water which is at atmospheric pressure.

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INDEX

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Richmond, Virginia 23230
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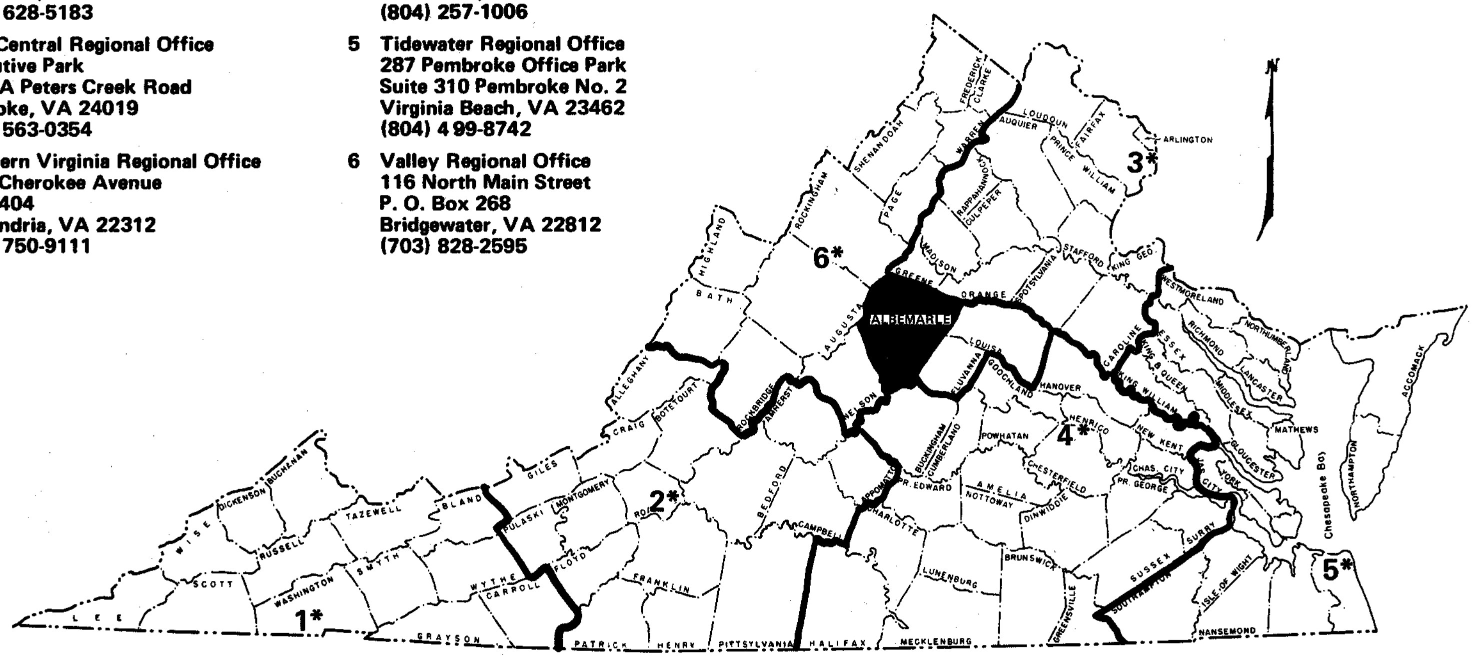

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